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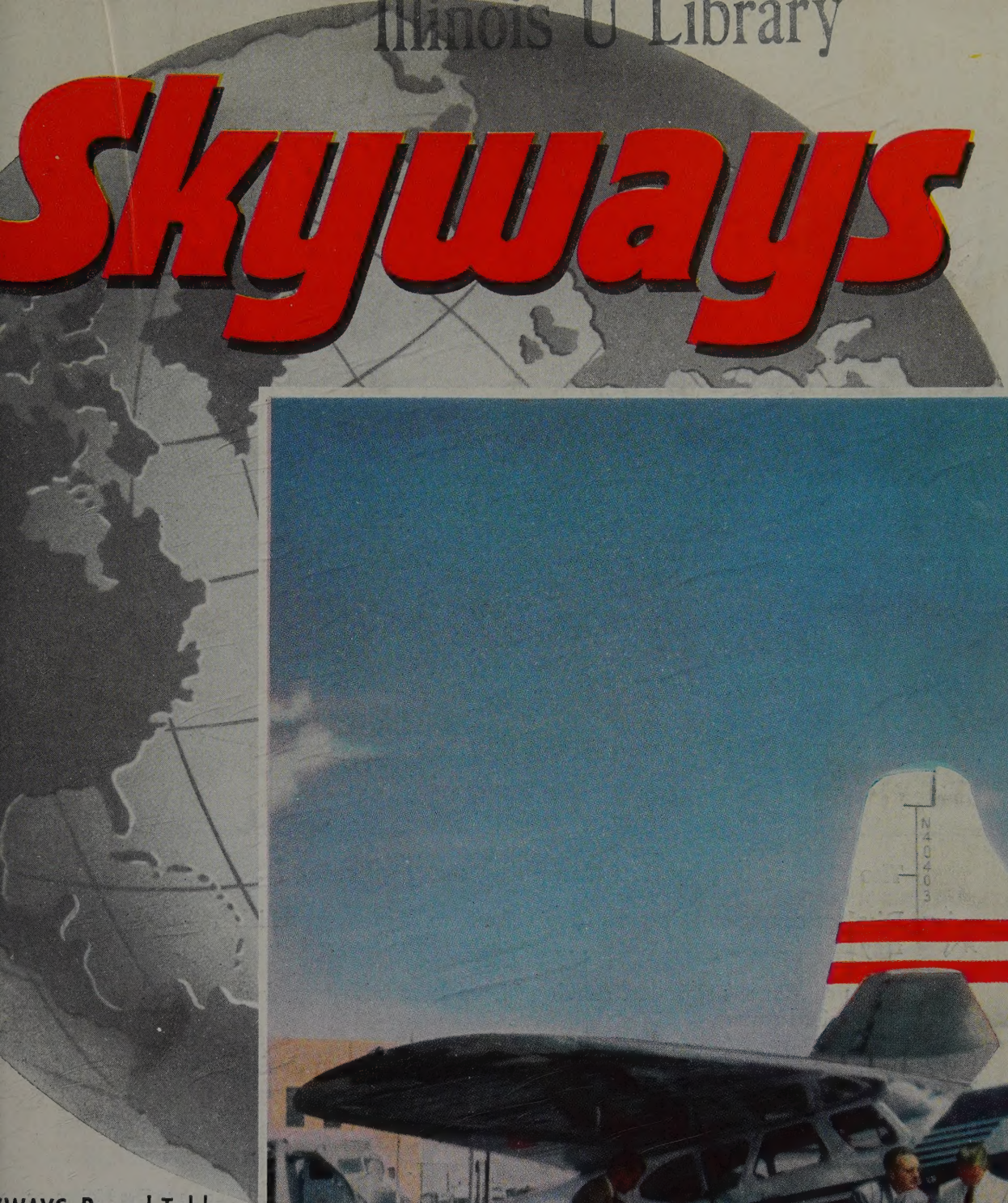

'WAYS Round Table:
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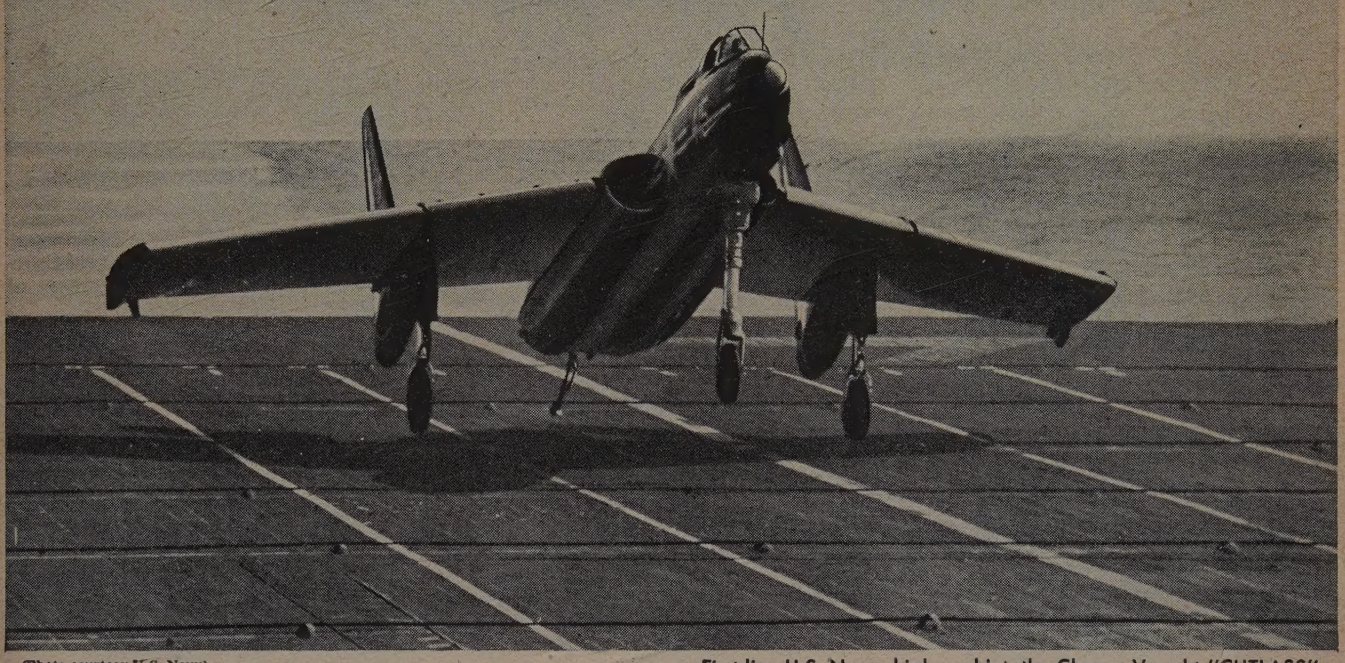

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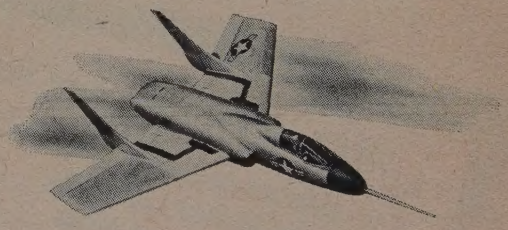

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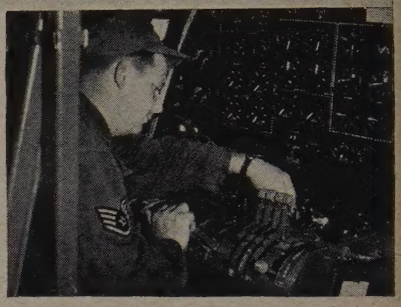
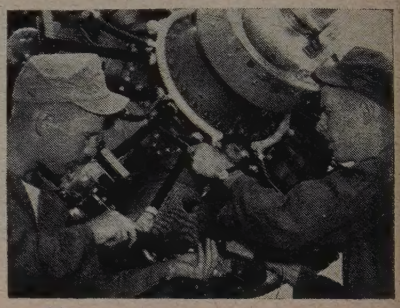


The Air Force needs trained multi-engine Flight Engineers

The Air Force needs trained Ground Control Approach Operators



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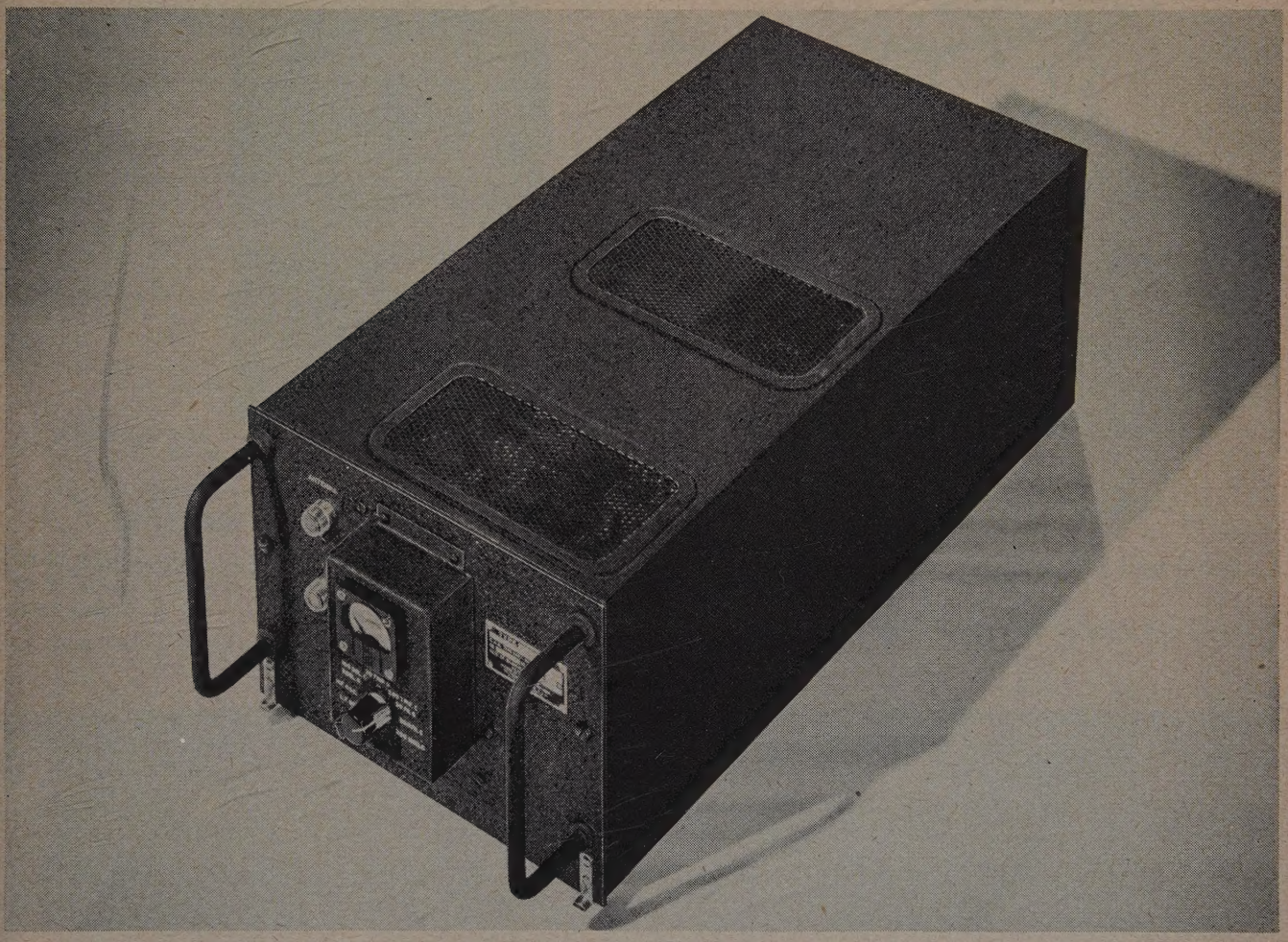

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Skyways

DECEMBER 1952

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COVER: This Cessna 190 Businessliner is owned by The Coleman Co., Wichita. Personnel are (left to right) R. McGilvary, Mr. C. Coleman and John Schul.

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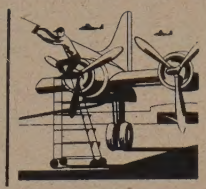

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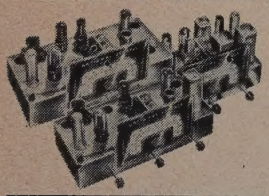

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Air Traffic Control

Gentlemen:

Let me begin by offering sincere appreciation for the new format and editorial policy of SKYWAYS. You have taken a long needed step in aviation publishing by instituting a fact gathering and disseminating medium for the vast number of people who earn their livelihood by flying, maintaining and controlling aircraft.

The Round Table discussion on Air Traffic Control was timely, interesting and instructive. However, I think an important portion of pilots was poorly represented. Namely, the single-engine executive pilot. Everyone seems to take it for granted that a professional executive pilot always flies a twin-engine Beechcraft, DC-3 or *Lodestar*. Consequently, all traffic control concerning executive operations is keyed to the capabilities of aircraft of that type and the excellent pilots who fly them.

It must be realized that there are thousands of *Bonanzas*, Cessna 195's and *Navions* using our airways daily, and they are flown by professional pilots holding commercial licenses, not just businessmen pilots with private tickets. I am one of those hybrid airmen, an old experienced professional executive pilot who makes his living flying a high-performance, well-equipped but single-engine airplane. I am paid a good salary for my efforts; have had more than 13 years of continuous flight experience, including over 4,000 hours as copilot on two major airlines. I am, therefore, reasonably aware of the problem and correct procedures to be followed during IFR flight.

It was understood when my company bought the *Bonanza* and before I undertook this employment, that it was not possible to conduct all-weather operations. As a matter of personal policy and in the interest of good airmanship, I do not recommend nor do I practice continuous instrument flight in single-engine aircraft. My company, however, expects and is getting (consistent with safety) maximum utilization from the *Bonanza* and its pilot. We have flown 500 hours since December, 1951, a portion of which has been on IFR flight plans. Since we base at Chicago Midway Airport, we have used that field's IFR facilities, including ILS and GCA-monitored approaches with highly satisfactory results and no confusion, thanks to the excellent approach and tower personnel at Chicago.

We do have one knotty problem though and that is with ATC itself. Whenever weather is marginal VFR or marginal IFR, there are occasions when, in my considered opinion, no hazardous conditions exist *per se*, yet good judgment indicates the necessity of filing an IFR plan. This is usually true under a condition of either high ceiling and low visibility (2,000 ft. or higher, and 1½ miles, for example) in smoke or haze, or under a condition of take-off under low ceiling and visibility with a thin (3,000 ft. more or less) stratus deck with CAVU above when it is desired to cruise on top and proceed to a terminal where VFR conditions exist.

Under such circumstances, you'd think it would be a simple thing to obtain an intelligent clearance from ATC, and proceed with the confident feeling that you had proper separation protection. Such isn't the case, and I've had several experiences that strongly suggest that ATC has no desire to cooperate with the "little fellow" on the basis of either 1) he is in a small plane and has no business on the airways during marginal conditions, or 2) his comparatively slow speed will complicate ATC's work, so we (ATC) will see to it that he stays on the ground.

Mind you, that is the treatment afforded the fellow who is aware of the collision hazard and asks for protection for himself and others. Some of our private and businessmen pilots, having either no instrument rating or only a smattering of instrument training, frequently fly in this marginal stuff, and no one even knows where they are. In the meantime, the rated instrument pilot who is trying to make his living transporting employer executives is forced to sit tight.

I say "forced" for this reason: while ATC cannot and knows it cannot deny a clearance to any properly equipped plane and properly rated airman, it can and does ask him to accept IFR clearances that any competent pilot knows will place him in a potentially hazardous position. For instance, I have been given clearances that would have put me at a cruise altitude where known icing conditions existed, when a higher (on top) or lower altitude would have been reasonable, safe and proper.

It seems to me that we are going to have to include the single-engine executive pilot in our planning for safer, more efficient and effective use of the airplane and the airways. Perhaps the answer lies in some form of restricted instrument clearance for single-engine pilots . . . or our own set of weather minimums, or by reserving airspace below 5,000 ft. for our marginal flying.

The new SKYWAYS should be a good clearing house for problems and possible answers to problems of this type.

E. JACK HOYT

Chicago, Ill.

SKYWAYS *plans to operate its Round Table discussions in the interests of you airmen who are directly concerned with promotion and development of aviation and air transport in this country. We welcome your suggestions, your brickbats and bouquets.—Ed.*

Gentlemen:

As a private pilot with 12 years of experience in the Air Force, CAA Communications and Air Traffic Control, I'd like to make some suggestions for consideration by the Air Traffic Control panel.

It is obvious that IFR procedures are written for DC-3 operations on LF four-course ranges. Cruising speeds have increased; radio facilities and aids to navigation are becoming more complex. Weather is still a factor. Air Traffic Control is, indeed, complicated.

I would suggest a change in the basic separations for IFR traffic. Reduce the time separation requirement proportionally for the faster cruising aircraft to conform to a standard distance, or a fixed distance determined by radio fixes. In line with this, make altitude reservations for aircraft of the same type and cruising speed, assigning the faster aircraft to the higher altitude, and like aircraft to the same altitude block. Reserve the minimum IFR altitude for feeder lines and the private pilot.

One thousand feet vertical separation seems adequate for an en route traffic. Eliminate the 500 on top completely. It is not safe with jet aircraft making penetrations all over the country, even though jets are usually vectored to penetration points.

Lateral separation should become a more positive control, especially on VOR facilities, since aircraft may be vectored to any desired course. This could be used effectively for climb-out procedures, providing increasing separation between inbound and en route aircraft, until a cruising altitude is reached.

IFR operation is dependent principally on weather. I would suggest that a high traffic density terminal airport be additional requirement for using IFR procedures within a 25-mile radius under Approach Control. Make this same Approach Control a Departure Control to the same boundary where Air Route Control takes over when the issued cruising altitude is reached. Communication with inbound and outbound traffic should be on separate channels that may be tied together when required. This Approach/Departure Control area should be collision proof, especially where radar monitor is employed.

As far as private pilots are concerned, one should not attempt a XC flight, much less enter a controlled airport, without functioning two-way radio. Most private pilots prefer VFR; probably few are qualified for IFR, but where two-way radio contact may be established I see no reason why a private pilot may not enter a controlled airport. Approach and Departure Control should work equally well for the private pilot.

ROBT. L. FLICK
Flight Engineer Student
Spartan School of Aeronautics
Tulsa, Oklahoma

Your letter and those of other pilots are being offered members of the Air Traffic Control panel for their comments. As soon as we get them, we'll pass them on.—Ed.

Gentlemen:

May I submit the following opinions re the Flight Operations Round Table on air traffic control.

1. Control zones at airports be 25 miles in diameter.
2. Minimums for VFR in control zone above 700 feet be 1500 and 5 miles. Same VFR as present for flight below 700 feet.
3. When Weather Bureau reports condition of "500 feet scattered to broken," have the WB call it 500 broken, not scattered.
4. Require two-way radio at control airports.
5. Provide for strict penalty for any pilot that chews out a tower on the air about the tower operator's decision on a landing sequence, etc.
6. Require all VFR flights at night to file flight plans if going into a control airport. Flight plan to be forwarded ahead so the tower can be expecting the flight.
7. Require all pilots to spend 5 hours in a tower before they get a Private rating; 10 hours in a tower before getting a Commercial ticket.
8. Change pilot ratings to add "ATC" after the rating if the pilot is qualified to operate in a control zone. A rating without "ATC" on it would mean that the pilot was not authorized to enter control zones.
9. Fight for surveillance radar at towers that are approach control. There are a great many near-misses that no one will talk about.
10. Do away with "500 on top" as an IFR clearance.
11. Solicit the airline and executive pilots and ask them if and when on an IFR clearance do they have to provide separation from other aircraft when in actual VFR weather. Eighty per cent will answer "No."
12. The minimum visibility (forward) in the Round Table was given as 1 mile along airways. That should be clarified: the 1-mile visibility applies only so long as the plane stays at 700 feet above the ground or below; when the plane goes above 700 feet, the visibility must be 3 miles (CAR 60.31 (d); 60.31 (c) Note and 60.73).

A PILOT
(Name withheld on request)
Washington, D. C.

An Airline Pilot Speaks

Gentlemen:

I have just read the October issue in which the transcript of the Flight Operations Round Table on the subject of air traffic control is printed. My congratulations to you. This is one of the finest articles printed anywhere to date regarding the subject matter. I think the procedure is excellent. There should not be an airline pilot in this country who does not read this article.

CAPT. LARRY SHAPIRO
United Air Lines
Los Angeles, Calif.

We're hoping to make that article available to all airline pilots. In the meantime those pilots who missed the October issue of SKYWAYS *and who would like to catch up with the article, should address a note to this office, giving name, address, company affiliation, etc., and we'll try to get a copy to them.—Ed.*

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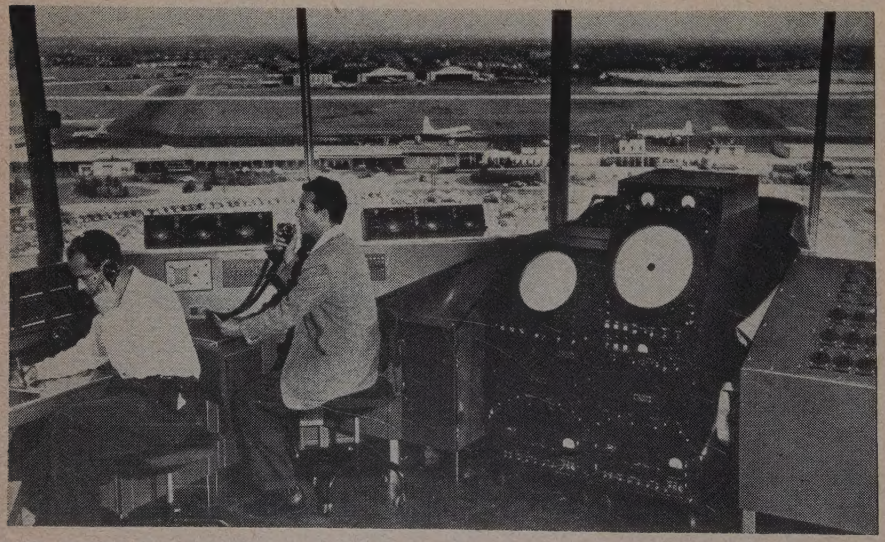
SHOP TALK

Spare Parts
Detroit, Mich. No little concern is being expressed by several operators of industrial aid aircraft (particularly DC-3 and war surplus planes) about the availability of spare parts for engines. One operator reported that his company had bought a supply of spare engines two years ago which they had expected to last them at least five years. He reported his company would consider itself very lucky if the supply enabled them to keep their fleet going another year or year and half. Many of the engines powering these aircraft are out of production; even worse, spare parts are not being made for these still-in-use-even-though-out-of-production engines. Cannibalizing is standard operating procedure, but after that . . . what?

Kudos for Gas Man
New Orleans, La. Corporate pilots in and around the country are mentioning Peter Alsop, gas dealer at New Orleans Municipal Airport, in glowing terms. The ever-willing Mr. Alsop has quickly become the pilots' best friend in the New Orleans area because of his enthusiasm in performing any service, large or small, for the airmen who stop at New Orleans Municipal for gas, etc. His list of accomplishments in the line of favors for the pilots includes sewing missing buttons on uniforms. Mr. Alsop provides service plus . . . and the corporate pilots are beating a path to his pumps in appreciation.

N. Y. International
New York, N. Y. According to reports, the ground surveillance radar installed on a so-called test basis at N. Y. International (Idlewild) Airport is a highly successful unit. Set up in the new control tower, recently dedicated by The Port of New York Authority, this ground surveillance unit originally was a Gilfillan project; then turned over to Airborne Instrument Laboratory, all under contract to the Air Force, actual owners of the equipment. It's a case of the unit being developed by the Air Navigation Development Board, built by AIL, owned by the Air Force, installed at N. Y. International by the Port Authority, maintained by the CAA, with ANDB helping to pay for the maintenance. At the present time, Airborne Instrument Laboratory is developing a second and improved unit, but it will be some time in coming. In the meantime, the only ground surveillance radar installation remains at Idlewild Airport . . . and the talk is that it will be eight years before a second unit is available for use there or anywhere else.

Butler Branch at LaGuardia
Chicago; Ill. Announcement was made recently that Butler Aviation, now operating at both Chicago and Washington National, will open another branch operation at LaGuardia Field, New York. Butler will be taking over the old Pan American hangar and will be offering corporate operators in the New York area the same excellent executive and maintenance service it has been offering at Chicago and Washington. Butler Aviation hopes to have its N. Y. center going by Dec. 1. This is welcome news to all owners and operators of corporate aircraft.



TWO SCOPES *(above right) are airport surface detection equipment being used for first time in regular commercial flight operations to control airplane traffic on ground. Equipment is located in 11th floor control cab of new control tower at N.Y. International Airport. This new control tower recently was dedicated by Port of New York Authority; is staffed by 14 men*

Business Plane Builders
Chicago, Ill. Several aircraft manufacturers are expressing an interest in designing and building aircraft for the executive-plane market. Among them are North American Aviation in California and Aeronca Aircraft, Middletown, Ohio. In the engine field, both Continental Motors and Fairchild are readying turbos that may have application to this market, but they are decidedly in the future.

Business Fleet
Washington, D. C. According to a recent report from CAA, more Americans than ever before in history are using utility-type aircraft in business. More than four-fifths of the approximately 60,000 private and corporation-owned aircraft operating in the U. S. were used for transportation by businessmen, farmers, government agents and professional workers. Business flying advanced 21% over the 1949 figure, and agricultural flying was up 52%. Business flying totaled 2,328,000 hours in 1951 compared to 1,922,000 hours in 1949. Pleasure flying in that same period decreased 34%. The industrial use of private aircraft in 1951 amounted to 403,000 hours.

The statistics clearly reflect a sharp increase in lightplane use for business transportation and utility purposes, and the decline in so-called pleasure or sport flying.

Comet 3
Hatfield, England. Details of the de Havilland *Comet* 3 have been reported by the de Havilland officials. The *Comet* 3 is the turbojet air transport that is being developed for trans-Atlantic operations, and U. S. interest in this airplane is running high, although no confirmed orders have thus far been placed. The Series 3 *Comet* is expected to have a 66% increase in payload, a 73% increase in stage length and a 30% lower unit operating cost. The *Comet* 3 prototype is expected to be flying in 1954, with production (40-to-50 planes per year) expected by 1957.

Comet	1	2	3
Gt. wt.....	110,000	120,000	145,000
Passengers	36/44	44	60/84
Engines....	DH *Ghost*	RR *Avon*-3	RR *Avon*-16
Thrust @..	5,000	6,500/7,000	9,000
Range—miles (full payload, 50-mph headwind, 200 mi. to alternate plus 45-min. stacking)	1,730	2600	3,000
Cr. Speed	465	470	500

Fuselage of the *Comet* 3 is 17 feet longer than *Comet* 1 and 14 feet longer than the *Comet* Series 2.

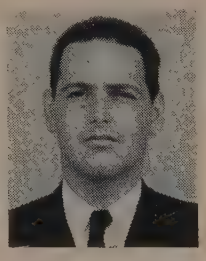
in this issue...

Steve L. Brown, Chief Pilot for Continental Can Company and master of his company's fleet of four aircraft, began his career in aviation as a student pilot (165-hp sport Kinner, then 40-hp *Cub*) in 1938. Thereafter came a session of employment at Consolidated Vultee Aircraft, membership in its flying club and eventually his private license. His wife was his first passenger. Sometime later, Steve earned his Commercial ticket, became a flight instructor at Ryan School of Aeronautics, then went on to become a copilot in the experimental department at Consolidated. As Steve puts it, thanks to such able pilots as B. A. Erickson (now Chief of Flight at Consolidated's Ft. Worth, Texas, Div.) and Phillip Profet (now Chief of Flight, Consolidated's San Diego Div.), he learned a lot about cruise control, aerodynamics, speed power work, three-engine cruise, etc. All of this, plus his cruise control work with ATC in the CBI area of operations, more than qualified Steve for his present position as Chief Pilot and General Manager of Continental Can Company's Aviation Department. Steve's article, "Air Fleet for business," tells a detailed story of multiple-aircraft operations that add up to profit for his company.

Working with Steve at Continental is Leonard Lee (now Chief of Maintenance) who was his engineer during the ATC days in India and China.

▶ During our first Flight Operations Round Table (on Air Traffic Control, October issue), the pilot-members of the panel were in good voice in expressing the need for better exterior light-up arrangements of aircraft to improve their "seeableness" at night. While many efforts are being made by various companies and agencies to correct this deficiency, the pilots agreed that the right answer is yet to make its appearance. Radar may be the eventual solution, but until then . . . what? Eliot Tozer, ex-Navy pilot, in his article "Visibility via Navigation Lights," brings us up-to-date on aircraft lighting developments and reports on the new light arrangements currently being employed by various airlines.

▶ Late in August Christopher Clarkson, former civil air attaché at the British Embassy in Washington, went to England to cover the Society of British Aircraft Constructors' Farnborough Show for us. His report of the show arrived just before press time and is included in this issue. The success of the display, despite the unfortunate accident, has led many returning U. S. visitors to Farnborough to express the hope that one day the aircraft industry in this country will put on a similar and equally impressive display of air power and progress.



Keith L. Gimson, author of "Long-Range Cruise Control," began his career with Delta Air Lines as a flight engineer in 1949. He became a First Officer some time later and flew the Orient Airlift for a few months. Keith learned to fly in 1941 in the CPT program, joined the Air Force in 1942, and flew 79 missions in B-25's in North Africa and Italy. He holds a Commercial License, single and multi-engine rating, Instrument ticket, a Flight Instructor's rating, a Flight Engineer's ticket, a Ground Instructor rating and is a qualified private pilot examiner. To date he has some 6500 hours in aircraft ranging from *Cubs* to B-29's.

▶ Next Issue: Flight Operations Round Table is getting its New Year's start at the Blackstone Hotel in Chicago, just prior to the opening of CAOA's Fifth Annual Meeting. The subject: "Specifications and Requirements for the Ideal Corporation Air Transport." Participants: executive pilots, corporate aviation department managers, and aircraft and engine design-engineers.

executive pilot's report

de Havilland DOVE

by Keith Tantlinger

Chief Aviation Development, Port of N. Y. Authority

When a foreign designed and built airplane invades the U. S. market and climbs quickly toward the top in popularity among important corporate aircraft owners and other operators from coast to coast, it's time to find out why.

So here's my "why" report on just such an airplane, the twin-engine de Havilland *Dove*. Fifty-two *Doves* or about six million dollars worth of de Havilland airframes and parts had been purchased for corporate and executive use by mid-September and sales were expected to rise substantially above that figure by the end of 1952.

There are important reasons for the success of this British "invasion" of the American market, which is already worried about the much-publicized English jet know-how which may descend upon our shores in the near future in the form of fast airline transports. One reason has been the glaring absence of a comparable American-designed light transport and the apparent lack of interest by our industry to recognize and survey the tremendous potential in the corporate-owned segment of aviation. Another is the all-round performance and dependability of the *Dove* and its external appearance which makes it look like a real transport-type airplane.

DH DOVE *is becoming increasingly popular in the United States as an executive aircraft. As of mid-September, 52 had been purchased for corporate use. It seats from six to 11*

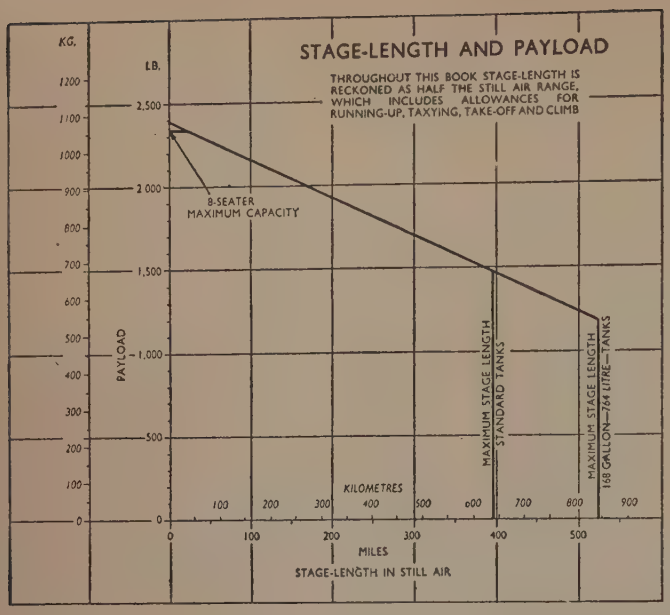
NUMBER *of access doors helps to make the Dove one of easiest airplanes to service. This photo (above) shows the Dove with its access doors open. These are an important factor in reducing turn-around time and holding down maintenance and repair costs. The doors have piano hinges, Dzus-type fasteners*

RADIO *and instrument diagram, inside hinged panel in the nose, is further aid to maintenance. Philip Dorrington checks it with Herb*

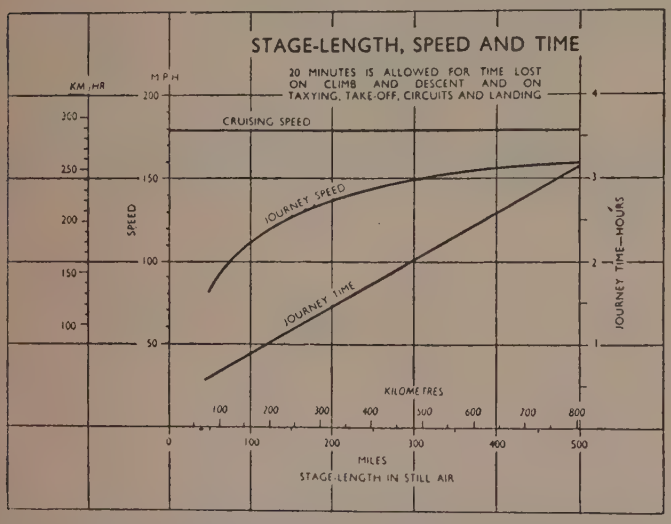
In addition, there exists a growing demand among corporations for a medium-size twin-engine aircraft of comparatively low hourly utilization which offers economical performance with flexibility in range and payload.

Equally important to American users is the de Havilland company's long background of experience in the air-transport field and its record of producing uniformly efficient aircraft. Its 1938 *Albatross,* a 22-passenger liner, will be remembered as one of the world's most efficient airplanes. Many years ago de Havilland set a precedent for its current invasion of the U. S. when in 1916 it supplied the famous DH-4 biplanes used to train our World War I pilots.

I was introduced to a brand new shiny *Dove* at Linden, N. J., airport by Howard R. Kelly, sales and service coordinator on the airplane for Pacific Airmotive Corporation, U. S. distributor; Philip J. Dorrington, technical representative of the de Havilland


STAGE-LENGTH AND PAYLOAD
THROUGHOUT THIS BOOK STAGE-LENGTH IS RECKONED AS HALF THE STILL AIR RANGE, WHICH INCLUDES ALLOWANCES FOR RUNNING-UP, TAXYING, TAKE-OFF AND CLIMB
8-SEATER MAXIMUM CAPACITY
PAYLOAD
MAXIMUM STAGE LENGTH STANDARD TANKS
MAXIMUM STAGE LENGTH 168 GALLON—764 LITRE—TANKS
KG.
LB.
KILOMETRES
MILES
STAGE-LENGTH IN STILL AIR

STAGE LENGTH AND PAYLOAD *graph gives the payload of the standard eight-place Dove for various trip lengths, under a typical cruise condition:–179 mph, using 60% of take-off power at 8,000 feet. Dove carries 267 gallons of fuel (with auxiliary tank) or 202 gallons in two tanks in each wing*



STAGE LENGTH, SPEED, TIME *graph gives the trip time and the trip speed for same typical case as stage length and payload graph: cruising at 179 mph, using 60% of take-off power at 8,000 feet, with 20 minutes for time lost on climb, descent, taxiing, etc. Stage length is under still-air conditions*

Aircraft Company; Jules Schaffer, assistant foreman at the field, and Robert Frank, demonstration pilot for PAC.

My flight in the *Dove* over New Jersey was preceded by a lengthy inspection of the airplane on the ground, similar to the type of rigid physical examination given to some of us test pilots who have had the opportunity to be processed through Mayo Brothers Clinic. By the time I completed the visual inspection, I knew pretty well why de Havilland could claim operating economy at both high and low ends of the utilization scale. From some of the airplanes or engineers' nightmares I have been associated with, the *Dove* would appear to be a maintenance man's dream.

With a few exceptions, the entire aircraft can be inspected and worked on without the use of stands or ladders, giving maintenance crews unusual freedom of movement and accessibility to the most remote units. I believe the *Dove* sets a new high for the number of access doors and quick-disconnect panels in one airplane. So many doors reminded me of a bathhouse at a busy beach—maybe Coney Island. At any rate, the number of doors in the *Dove* provided at bit of comic relief at Linden airport.

Bill Mechnik, the Newark photographer who accompanies me on these evaluation flights, watched Schaffer open door after door and then suggested that he open all doors simultaneously for a picture.

I lost count of the number of doors Schaffer opened but within a few minutes it seemed that about 50 percent of the *Dove's* skin was attached to piano hinges and Dzus-type fasteners. At that point, Dorrington, who had watched the performance with a great deal of amusement, remarked: "Well-ventilated aircroft, isn't it?"

His wry comment underscored the fact that the maintenance factor was a basic design consideration in the *Dove* and that the simplicity and quickness with which maintenance jobs can be performed determine, to a large extent, the measure of a plane's operational economy. Although the *Dove* is a small airplane, it offers maintenance standards comparable to or better than those provided in much larger aircraft flying scheduled air lines.

In addition to accessibility, there are many aids to quick and easy maintenance and overhaul. For example, the door covering the main electrical junction box has on the inside a complete and simple wiring diagram. The same sort of instructional panel is attached to the hinged door in the nose which describes all the service piping in the airplane, such as pneumatic system, de-icing, fuel, manifold pressure, vacuum, and priming systems. All conduits, lines and control cables are colored and code-numbered so that any of them can be identified at any point in the airplane. Many components are interchangeable, including powerplants, elevators, and main wheel struts.

It may be unusual for a pilot to turn first to the maintenance features of an airplane, but I feel this is imperative and believe few aircraft in this weight class can match the *Dove* in this respect.

From the pilot's viewpoint, this trim low-wing transport flies like a dove. Its take off with flaps at 20° and each of the two *Gypsy Queen* engines at full rated power (345 hp) is smooth and effortless. However, take-off will be improved when horsepower is stepped-up on future models. I let the *Dove* fly itself off the Linden airport and we were airborne at slightly above 90 mph. The best climbing speed is around 115 mph.

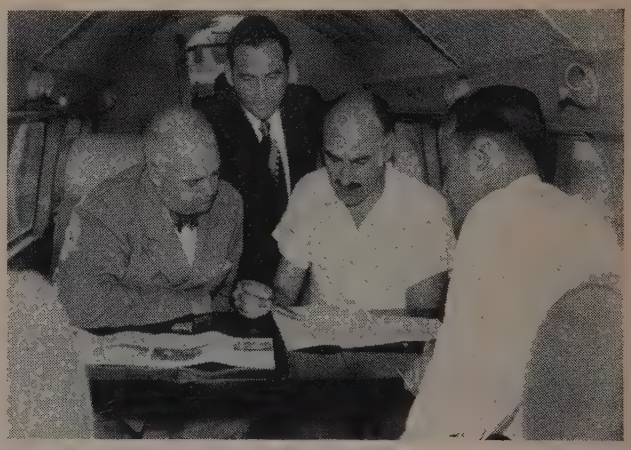
The *Dove* has good stability laterally, directionally and longitudinally under all flight conditions, and I found all controls light and effective.

The stall is not very well defined in the *Dove,* but you can always detect its approach because of the normal buffeting. However, I saw no tendency for any violent maneuver to occur and stall recovery was straight forward and immediate.

In the *Dove* the de Havilland engineers have given us an executive-type airplane with remarkably good one-engine performance. I am informed that they were shooting for the high level of one-engine safety achieved in the 1939 *Flamingo,* which was twice as big as the *Dove.* Whether they hit the mark I do not know, having never flown the earlier plane, but I can predict that few American pilots will find anything objectionable in the *Dove's* ability to climb or maneuver on one engine.

It should be borne in mind that all present executive-type transports lack engine supercharging and, therefore, do not have the horsepower needed for adequate single-engine performance at altitude for safe flight in many sections of the U. S., such as in the mountainous areas (*Continued on page 48*)

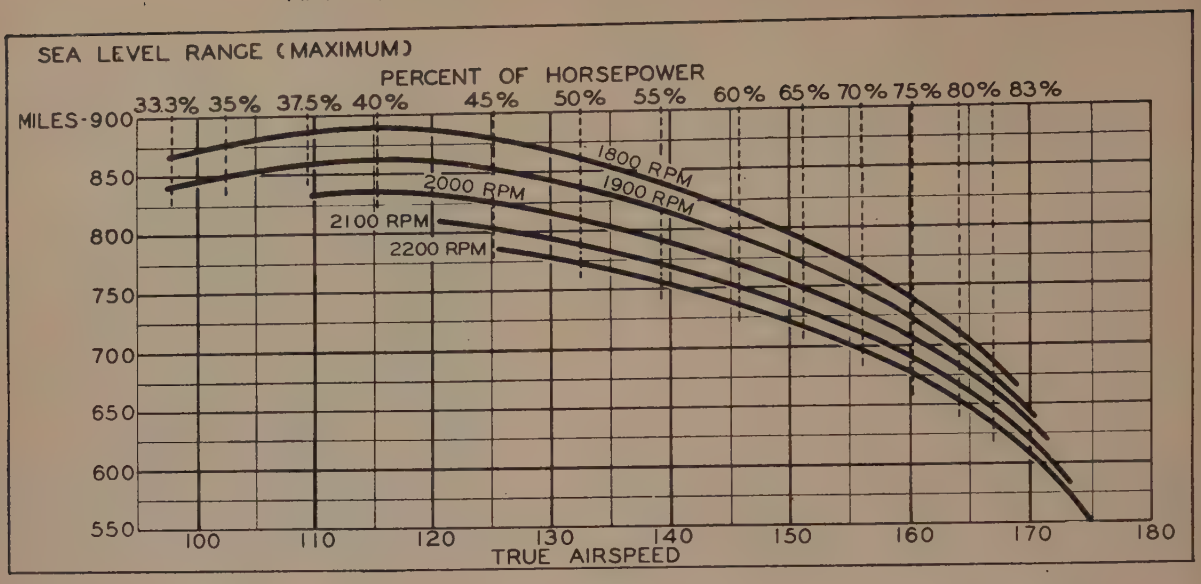
CHECK PILOT *Herb Fisher inspects prop's constant speed unit. Jules Schaffer demonstrates its ease of maintenance*

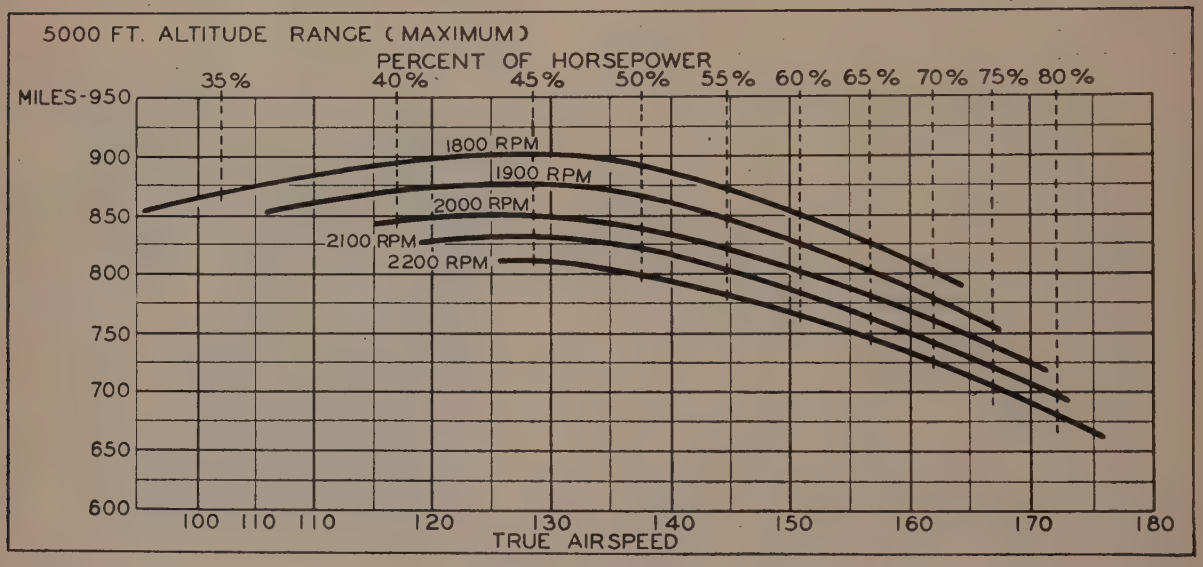


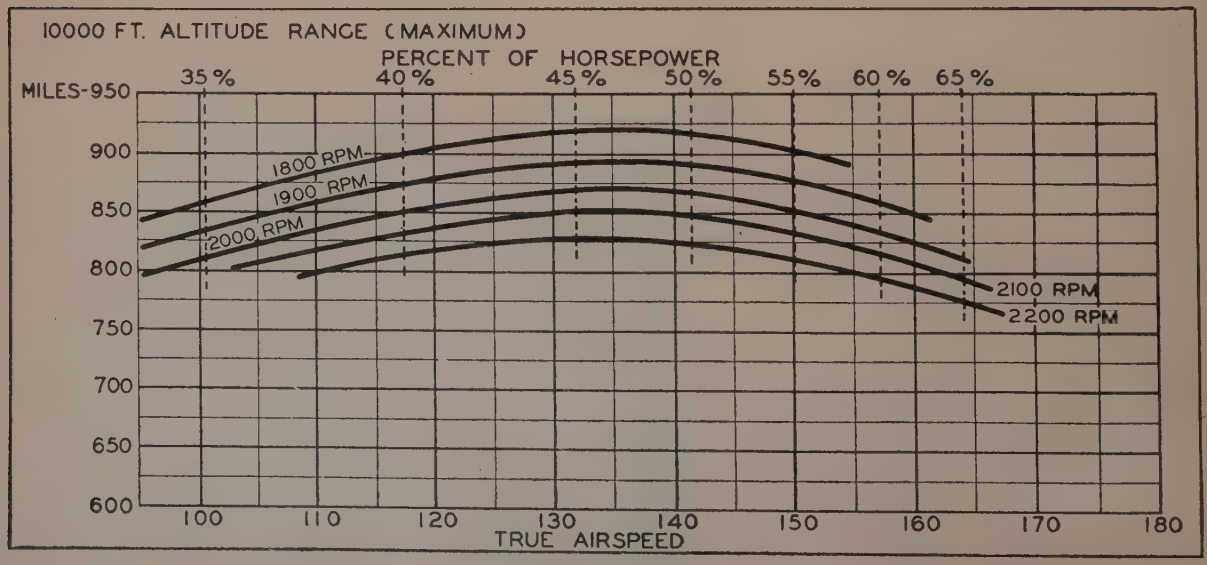
CABIN *appointments include dropleaf table. Here Herb (left to right), Phil Dorrington, Bob Frank and Howard Kelly use table for pre-flight discussion of power settings*

FOREMAN *Schaffer and Herb Fisher examine convenient Crabtree junction box. Diagram is on inside of door. Note battery compartment*

RANGE CHART — CESSNA MODEL 190







LONG-RANGE CRUISE CONTROL

Fuel and engines can be saved if pilot understands and uses cruise control

by Keith L. Jinson

First Officer, Delta Air Lines

Engine operation, power settings, fuel consumption and range should be uppermost in every pilot's mind regardless of the type of plane being flown or the distance of the trip. Cruise control isn't specifically for long over-water flights. Long-range cruise control in simpler words means most miles per gallon, and is as important to the *Navion* and *Bonanza* pilot as it is to the pilot of a DC-6.

Many pilots do not use any type of cruise control, because they believe that it is too time consuming or too involved. A quick look at the range chart for the Cessna 190 (*Fig. 1*) will show how simple the use of cruise control can be. It is very easy to find the best power and altitude to use for any given flight with a cruise chart such as this; however, for a more complete understanding of cruise control the pilot should be familiar with what goes into the making of a cruise-control chart and the flying technique required to get the most miles per gallon.

Before a pilot can completely understand the use of a power chart, he should be familiar with mixture setting, fuel consumption, speed vs. power, fuel vs. mileage, effects of weight, altitude, winds, attitude of the ship, and trim. With a careful study of the following, the pilot should be able to get many more miles per gallon.

Mixture Control

One of the most important considerations in getting the most miles per gallon is the proper setting of the mixture control. Power and range are determined by the weight of fuel being used. The weight of fuel can vary with temperature, type of crude oil used in making the fuel, and the grade of fuel being used. This weight can (*Continued on page 54*)

FIG. 2—*Best power setting is indicated on Fuel/Air chart*

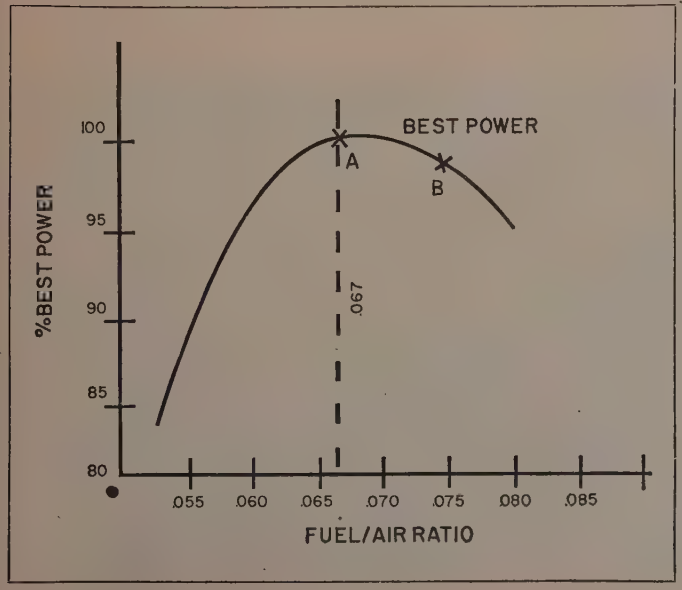
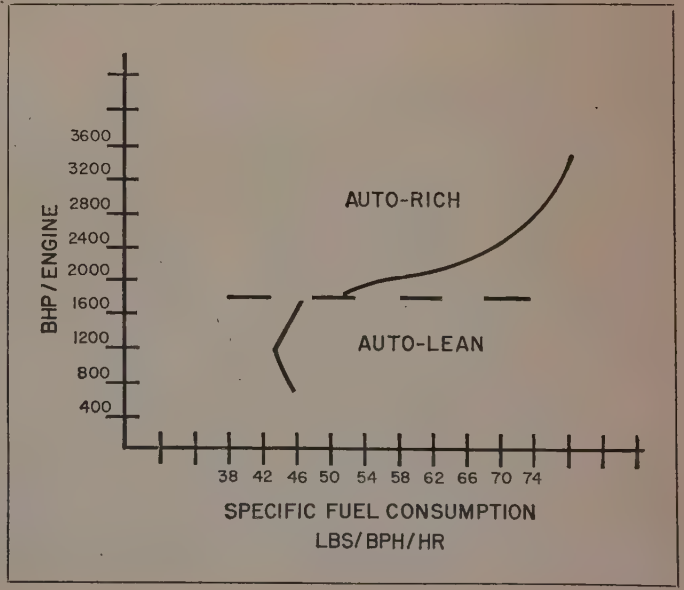


FIG. 3—*Fuel consumption curve shows fuel used per hr/hp*



Visibility via Navigation Lights

Blacken the sky with boom-time air traffic—more and more airline planes and more and more company planes—then add more and more Air Force and Navy transports, with still more jets to bore into the tangle at just-under-sonic speeds, and you'll know why such government and civilian watchdogs as the CAB and the Flight Safety Foundation are growing collectively grayer and balder over the air traffic problem. Particularly since improvement in aircraft visibility has not kept pace with what the upsurge in traffic demands. And even more particularly since there won't be any real improvement for a long time.

Everyone in aviation is conscious of the drastic need for immediate action to improve the "seeableness" of aircraft. Ruland M. Woodham of the Daniel & Florence Guggenheim Aviation Safety Center can tick off—without bothering to refer to records—crash after crash resulting from mid-air collisions. "Aircraft visibility, both day and night, is far from adequate," says Mr. Woodham. "It's one of the most pressing problems the Center is working on."

Lewis B. Moore of the Grimes Manfacturing Co. says that now, "The problem of recognition is especially important at airports where a number of airplanes are converging."

And, most important of all, the pilots are conscious of the need. One pilot at a recent SKYWAYS Round Table on Air Traffic Control said almost prayerfully, "Today's planes ought to be lit up like Christmas trees."

But even though almost everyone realizes that aircraft should be better lighted, no one is quite sure how best to do it. Lewis Moore says, "It's my feeling that some radical departure from the present system will be necessary. I'm not at all sure as to what will be satisfactory."

On firmer ground, Frank B. Brady of the ANTC Div. of the Air Transport Association of America asserts, "The most promising line of development appears to be in the use of high intensity sealed-beam lights."

Yet, the Aeronautical Medical Equipment Laboratory at Philadelphia's Naval Air Material Center replies, "Although there seems to be general agreement that higher intensity exterior lighting is necessary, AMEL believes that consideration has to be given to factors other (*Continued on page 52*)

LINEAR LIGHTING *for better night visibility is undergoing tests at Navy's Aeronautical Medical Equipment Laboratory. AMEL outlined (below) plane's wingtips, fins, elevators with lucite, installed bulbs*

UNITED AIR LINES *uses the Grimes rotating navigation light on tip of vertical stabilizer. Pilots report light is visible from distance of 15/50 miles*

Air traffic increase emphasizes need for better aircraft lighting; new navigation lights offer some help

by Eliot Tozer

SWIVEL BEACON, *installed atop Capital Airlines' DC-4's (below), enables planes to be spotted from a distance of 20 miles or more*

CONTINENTAL CAN CO. *air fleet (above) consists of four airplanes: a converted B-24, a Lodestar, and two Twin-Beechcrafts*

CHIEF PILOT *Steve Brown (left), checking weather teletype machine in CC's hangar office, joined the company in fall of '45*

HANGAR *at Morristown, N.J., base of air operations for Continental, was built at cost of $300,000. Note visiting Twin Bonanza*

AIR FLEET for business

Continental Can Co. operates four-plane business fleet and has flown 10,400,000 passenger miles

by

Steve L. Brown

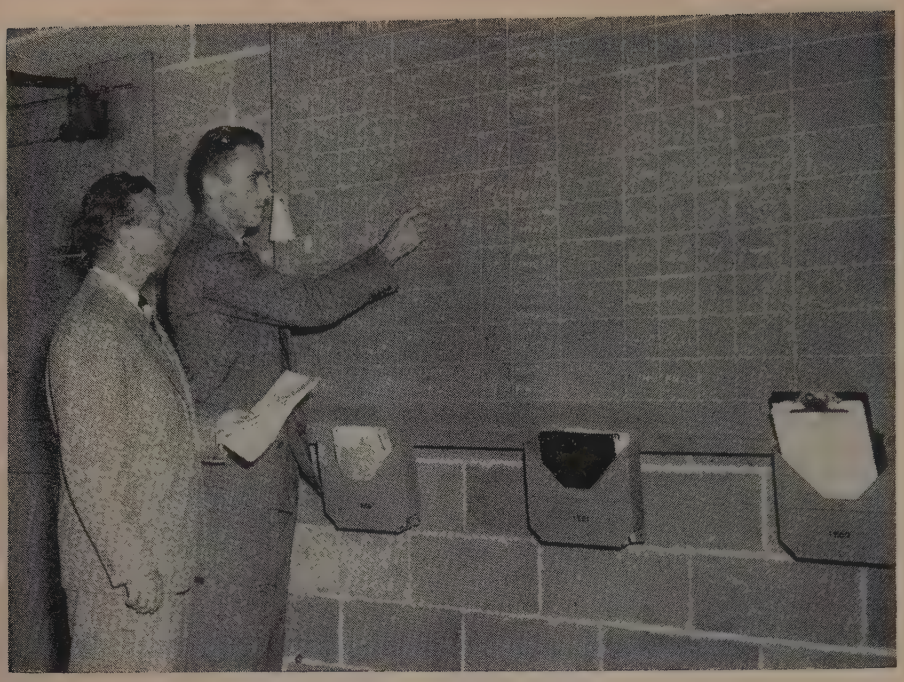
Chief Pilot,
Continental Can Co, Inc.

as told to
Frank Harvey

Back in 1940, when Continental Can Company, Inc. got into corporation aviation, a lot of timid people thought flying was something exclusively for the birds. The timid souls maintained that any executive who stepped into a company airplane ought to be decorated for service above and beyond the call of duty.

Continental, however, could not wait for the apprehensive citizens to put their blessing on airplane travel. Continental has a big job to do. With plants and offices scattered in out-of-the-way places all over the United States, Mexico and Canada, the problem of transporting key people fast and often was critical. Sleeper jumps took too much time and often left busy executives gritty-eyed and exhausted upon arrival. Even commercial air travel was often not too perfect due to layovers, indirect routing, and all of the minor but cumulative headaches of getting tickets, checking baggage, scrambling for seats, etc. Continental bought a Twin-Beech, rented hangar space at Long Island's Roosevelt Field, and hired a staff of airmen and mechanics to keep the plane flying. It was worthwhile from the start.

CONVERTED B-24, *used 80% of time on sleeper hops to the West Coast, features six berths, two reclining chairs; crew of three*



FLIGHT DISPATCH *board in Continental's hangar shows location of CC's aircraft, crewmen aboard, date due back, etc. Checking on trip are Brown and Leonard Lee (right)*

The Twin-Beech was a big success. Had it not been for the war, Continental's aviation department would have started expanding, then and there. However, when the Japanese bombed Pearl Harbor and Uncle Sam crooked his finger for all available aircraft, the Twin-Beech and its crew went to war and Continental executives went back to their upper berths and aisle seats on crowded DC-3's.

The seed, however, had been planted. It took firm root in 1941 when I chanced to meet Carle C. Conway Jr., son of one of the most active Continental Can Company pioneer executives. I was flying B-24's on high-altitude cruise-control experiments for Consolidated Vultee. Carle Conway Jr. was flying gasoline into China for the U.S. Air Transport Command. We met on an air field in India.

"Steve," Carle said to me one evening after we'd gotten to know each other well, "Continental Can Company needs a good aviation department after the war. I plan to help organize one. I'd like both you and your engineer, Leonard Lee, to come with me on the deal. I'll set it up and after it's working I'll bow out and let you and Lee carry on."

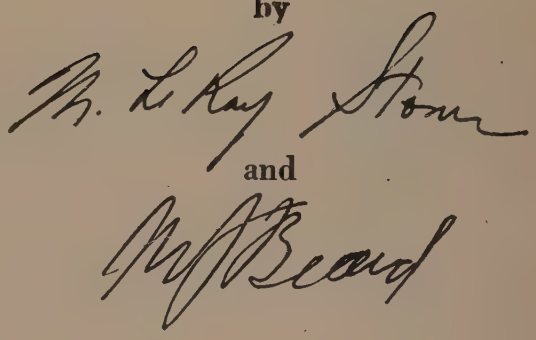
Naturally, I was anxious (*Continued on page 49*)

LODESTAR, *like the B-24 and the two Twin Beechcrafts, is fully instrumented for instrument landings, blind flight, etc. Both the Lodestar and the Liberator are flown an average of 50 hours a month; the Twin Beechcrafts, 60 hours*

Committee S-7

COCKPIT REPORT

by



and

Standardization of transport aircraft cockpits—which the President's Airport Commission recently called an important step in reducing accidents due to pilot error—is being studied intensively by SAE's Cockpit Standardization Committee S-7. Since it was organized early in 1950—at the request of the Air Transport Association—it has inaugurated 10 projects, three of which have been completed. Each project covers one kind of cockpit equipment in which simplification and standardization are needed. In each case the actual work was carried out by a subcommittee which developed the standard and then reported back to S-7 for final agreement and approval before the standard was released.

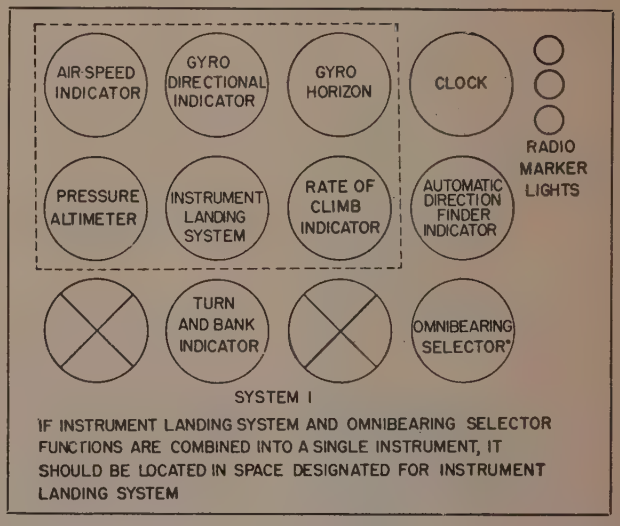
Early discussions amounted to debates concerning the scope, influence, and possible safety aspects of committee work. For instance, at the first meeting H. H. Young of Douglas Aircraft suggested that the prime interest of the committee would be interchange of information on cockpit arrangements and to criticize current designs, while Scott Flower of Pan American Airways felt that the committee should deal only with the basic problems as applicable to various types of airplanes in the transport category. M. B. Cahill thought that primary controls should be considered, along with other items directly involving flight safety. After much review and debate the first meeting resulted in assigning three projects plus a resolution of committee scope:

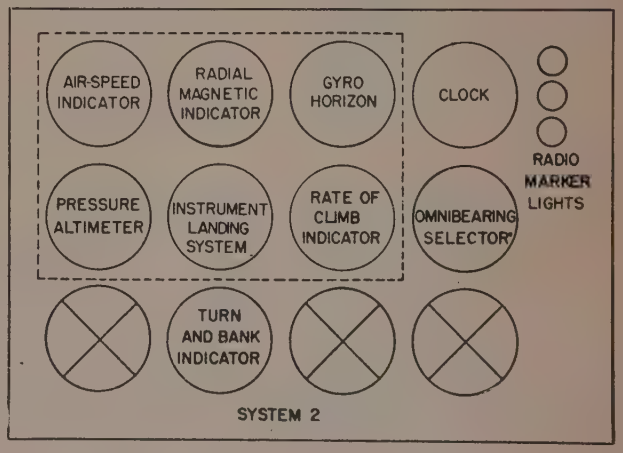
"The objectives of Committee S-7 will be to recommend certain presently established and proven standards of configuration, functions, and relationships for cockpit units applicable to commercial transport type airplanes; and make studies toward recommending certain operationally acceptable standards for configuration, functions, and relationships of those cockpit units for which there are no approved standards."

The projects already completed are:

1. Instrument and Cock- (*Continued on page 58*)

INSTRUMENT PANELS, *set up by S-7, include: System 1—basic layout of primary instruments for ILS; System 2—modified to include RMI as directional unit*

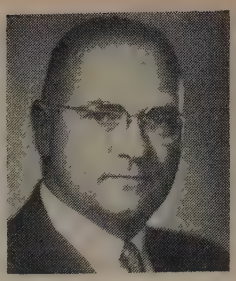

AIR-SPEED INDICATOR
GYRO DIRECTIONAL INDICATOR
GYRO HORIZON
CLOCK
RADIO MARKER LIGHTS
PRESSURE ALTIMETER
INSTRUMENT LANDING SYSTEM
RATE OF CLIMB INDICATOR
AUTOMATIC DIRECTION FINDER INDICATOR
TURN AND BANK INDICATOR
OMNIBEARING SELECTOR*
SYSTEM 1
IF INSTRUMENT LANDING SYSTEM AND OMNIBEARING SELECTOR FUNCTIONS ARE COMBINED INTO A SINGLE INSTRUMENT, IT SHOULD BE LOCATED IN SPACE DESIGNATED FOR INSTRUMENT LANDING SYSTEM



Col. Robt. V. Garrett

George C. Prill

H. F. Penfold

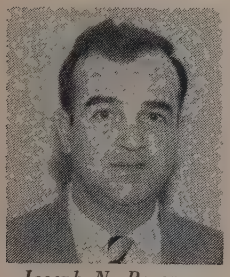


Charles Froesch

Adm. Luis de Florez

Lt.Cmdr.George Hoover

R. W. Blake



Joseph N. Pecoraro

Col. J. E. Boudwin, Jr.

John B. Kelly, Jr.

H. F. PENFOLD, Assistant to Executive Vice President of Collins Radio Co., is a graduate of Brooklyn Polytechnic Institute (1936). He was Project Officer, Fighter Group, Electronics Division, Navy Bureau of Aeronautics during war.

GEORGE C. PRILL is with the Air Carrier Div., Bureau of Safety Regulations, CAB. He holds an Aeronautical Engineering Degree from N.Y. University and worked with Engr. Flight Test Dept. of Douglas, and in Operations Dept, TWA.

COL. ROBERT V. GARRETT quit logging his flight time (15,000 hours) some time ago. A nationally known expert in developing, teaching bad-weather instrument flying, Col. Garrett holds an ATR; as first pilot, commands CAB's DC-3

LT. CMDR. G. W. HOOVER enlisted in Navy in 1934; graduated Flight School, 1938. He was designated AEDO (Aeronautical Engr. Duty) in 1946; graduated B.S. Physics, Univ. of Nebraska, 1951; is now stationed at Air Branch, ONS.

COL. JOSEPH E. BOUDWIN, JR. served with Air Corps in World War 1; was civilian pilot in '20's, then recalled to active duty with Air Force in 1942. He is now Chief, Technical Branch of Reports Div., Office of Inspector Gen.

JOSEPH N. PECORARO became head of Air Applications Equipment Section, Special Devices Center, Office of Naval Research in 1945. Prior to that he served as representative of Bureau of Aeronautics at Grumman, Brewster, GM.

ROBERT W. BLAKE, staff engr. in office of Chief Engr, Pan American, is a graduate of MIT (1941); joined PAA as an apprentice engineer after graduation. Served with Naval Reserve during war.

JOHN B. KELLY, JR. began his career with Pan American as copilot in 1943. He flew PBM's in South Pacific during war and became assistant to Asst. Chief Engineer, Pan American in 1951

CHARLES FROESCH, Vice President-Engineering, Eastern Air Lines, joined Eastern as Chief Engineer in 1935. He began his aviation career in 1912 with Farman Airplane Co., in France. Mr. Froesch is a member of SAE, IAS.

REAR ADMIRAL LUIS de FLOREZ, Chairman of Board, The de Florez Co., Inc., is graduate of MIT. He was appointed Lieut. Cmdr., USNR, in 1934; became Rear Admiral in 1944. He was named Chief, Naval Research in 1946.

M. G. (DAN) BEARD, Chief Engr. of American Airlines, is graduate of Univ. of Mich.; learned to fly at Kelly Field, and in the years between then and now has been Test Engineer, Test Pilot, Instrument Instructor, Chief Engr. Pilot.

M. LeROY STONER, Manager, Aeronautical Department of the Society of Automotive Engineers, joined SAE as Staff Engineer in 1945; became Manager of Aero. Dept. in 1949. Prior to joining SAE, he headed Standards Unit, GM.

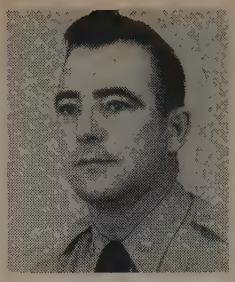
LT. COL. T. E. COLLINS, JR., Chief, Standardization Branch, Deputy Chief Pilot of MATS, began his AF career in 1942. He was fighter pilot during war. In 1950 he was picked to help establish the Combat Cargo Command in Korea.

COL. JAMES L. LEE, Chief, Flight Branch, Directorate of Operations, USAF, is graduate of U. of Minn. He joined Air Force in 1938; was named Air Force Liaison Officer with the Greek National Defense Staff in 1948.

O. E. (PAT) TIBBS, Chief of Flight Test, Glenn L. Martin Co., was a member of the first class to graduate from Air Corps' Randolph Field (1931). He was commissioned in 1932 and went on active duty with 12th Observation Group at Brooks Field. After active duty with Air Corps, he flew the mail, did some flight instructing, test work. He joined the Martin Co. as a test pilot in 1941; was named to his present position in '45.

M. G. Beard

M. L. Stoner



Lt. Col. T. E. Collins, Jr.

Col. J. L. Lee

O. E. Tibbs

SKYWAYS FLIGHT no.3 OPERATIONS ROUND TABLE

Cockpit simplification and standardization

CHARLES H. COLVIN, moderator of the Cockpit Simplification and Standardization Round Table, is a pioneer in the development of aircraft instruments. He founded Pioneer Instrument Co., in 1919. From 1941 to 1944 he was Director of Daniel Guggenheim School of Aeronautics at N.Y.U. He left that post to make a study for Navy BuAer in repair of instruments. He is now Dir. of Colvin Laboratories.

Charles Colvin (*Pres., Colvin Laboratories*): "The problem of simplification and standardization of cockpits is by no means a new problem. During World War I when I was working for Sperry Gyroscope, Mr. Sperry was a member of the Naval Consulting Board. This Board had set up a sub-committee to study the simplification and standardization of airplane cockpits. Two of the members of that sub-committee were Mr. Sperry and Thomas Edison. The committee met in Washington and during the meeting someone suggested that the committee go out to Anacosta and look at some actual cockpits. Mr. Edison refused, said that he didn't want his thinking on the proper arrangement of a cockpit to be influenced by any cockpit that had ever been made, and returned to New York. There may or may not have been some error in that notion.

"Today, however, we have gathered together you who are very familiar with cockpits and who, many through experience, know the operational problems that arise from having to deal with an assortment of arrangements of instruments, knobs, switches, etc. Each of you has studied the problem of simplification and standardization and each of you undoubtedly has his own idea. Those ideas are up for consideration today.

"Admiral de Florez, this problem is one that you have given much thought to. Would you like to start the discussion?"

Adm. Luis de Florez (*Chairman of Board, de Florez Co.*): "Simplification and standardization of cockpits are very easy

PRE-ROUND TABLE *get-together found (left to right) George Prill, Charles Colvin, Joseph Pecoraro and Lt. Cmdr. Hoover discussing instruments*

MODERATOR *Charles Colvin (at right) opened Flight Operations Round Table by calling on Adm. Luis de Florez (on his right) for panel opinions*

things to talk about and difficult to accomplish. I believe of the two, simplification is the most basic and necessary. If we have less to standardize, we'll have less of a problem. Aircraft have grown larger, their performance has increased and they are becoming more complex every day. Each gain in performance is accompanied by some kind of gadget or requirement for the cockpit. The cockpit is becoming so replete with instruments that it's perhaps not too far-fetched to recount a cartoon that appeared in the *New Yorker* magazine some years ago: a pilot turned to his copilot and asked, 'What is that instrument? I never really noticed it before.'

"During the war, or at least during a large part of it, George Hoover and I had the problem of training, which highlighted the shortcomings of the cockpit in instrumentation and controls. The problem of training is not merely teaching people how to fly but mostly teaching them what to do with their airplane after they have achieved flying skill. The young pilot had to learn to understand all the readings observed and to be familiar with all of the instruments so that they would mean something to him in terms of action. As the war went on and the performance of the aircraft increased, more and more things went into the cockpit until we reached the point, as of now, where something has to be done.

"There are only a certain number of things a human can do simultaneously; there are only a certain number of things he can think about at the same time. He is subject to certain reactions due to fatigue. There is a difference, of course, individually between one pilot and another, but on an average we have reached the limit. In fact, the limit of the capabilities of the individual was reached during the last war. But we go right on adding instruments and gadgets to aircraft. We have added instructions and we have added controls and instructions from the ground. Now the question is, 'Are we going to allow this process to continue and is the time going to come when the very accumulation of dials, readings and controls in the cockpit is going to sink us all?'

"In the services we are aware of the need for simplification now. We are actively engaged at the present time in work which may simplify the job of telling the pilot what is going on. It was our thought during the war—and it still is—that if we could combine the reading of certain instruments in some logical fashion, and tell a man what to do—not simply give him information and let him decode it mentally—it would be the right direction in which to proceed. For instance, we made a directional horizon which combined the gyro turn along with the horizon that denoted attitude, so that by reading just this one instrument the pilot could fly the aircraft without referring to three instruments, as we normally do. We conceived an idea that we might be able to give all of the engine instruments and the general-information instruments vertical readings; that these might appear on a panel in such a way that the vertical lines, the tops of the ver-

FLIGHT OPERATIONS ROUND TABLE

Subject: *Cockpit Simplification and Standardization*

Place: *Wings Club, Hotel Biltmore, New York City.*

tical lines, would be level in cruising flight, so that any discrepancy in the 'line-up' would be noticed. We experimented with the idea that a pilot doesn't really care whether he has a certain amount of oil pressure or not, providing he is in a safe range.

"The influence of the clock dial, which is a good motion and an indication we are all familiar with, apparently has been the motivating factor behind most instruments. We all realize that almost every one of these circular instruments has a different scale and conveys a different meaning. Not only must the pilot read the instrument but he must think 'This is inches of mercury . . . this is going to tell what my manifold is,' etc. Then he looks somewhere else on his panel and finds that the measurement is in feet, and somewhere else it's in miles per hour. There is this tremendous divergence in scale in the cockpit. If we can reduce the mental effort of the man to integrate these things—if we can tell him what to do because certain conditions exist instead of just throwing a lot of information at him, we are going to be able to simplify the mental processes of the pilot. We have tried to do that by simplifying the cockpit mechanically.

"George Hoover made one of the first console cockpits that we had in fighters and it was very successful. We tried to cut down the number of knobs. We tried to cut down the sharp corners in the aircraft, but we have not succeeded in doing very much in that line. We did, however, succeed in reducing the number of levers.

"I think we all agree that the cockpit must be simplified. Perhaps some day we'll get wise enough to simplify the airplane. I merely suggest here that there are certain directions in which we can go. One, you might say, is in the direction of instruments that tell the pilot what to do, not just hand him information. Another direction might be toward the development of instruments with a better form of reading; maybe circular readings aren't the best. It certainly would not mean that we would have to change the working of the instruments, but it means a conversion of the reading of that instrument to give a better presentation.

"I had the opportunity last year to take some training in flying a helicopter. The visibility was good out of the beautiful canopy that enclosed the pilot and copilot. But then somebody began building a Christmas tree in front of it in the form of an instrument panel. It's a T-headed affair and at first it only contained a couple of instruments: the tachometers and the altimeter and airspeed. Then it started (*Continued on page 38*)

SAE-7 *Committee report was offered by American Airlines' Dan Beard (center), chairman of that committee. Munitions Board accomplishments were detailed by Col. Boudwin (on Mr. Beard's right). Adm de Florez opened the discussion*

to fly HIGHER and FASTER

by Frank J. Taylor

Cliff Garrett, a blue-eyed, sun-tanned Californian, likes to say that he has built a solid business on thin air.

This is literally true. In the last decade and a half Garrett and his staff at AiResearch, the company he founded, have become outstanding authorities on the problems of men and machines in the upper troposphere and lower stratosphere—the area five to 50 miles above the earth's surface. In two bustling plants sprawled alongside the Los Angeles and Phoenix airports, Garrett has 6,000 employees designing and manufacturing aircraft accessories without which flight into this thin blue yonder—now our country's most critical defense frontier—would be impossible.

The name of AiResearch is a by-word among aircraft designers today. "We can't fly any faster or higher than gadgets like Cliff Garrett's will let our planes go," says Hall Hibbard, chief engineer for Lockheed Aircraft Corporation.

The gadgets referred to seemed, yesterday, to be in the realm of impossibility. One of them is a midget cooling machine, about the size of a grapefruit and weighing 16 pounds. This little tempest in a teapot has a turbine impeller that whirrs 100,000 rpm. The device is so efficient that in laboratory tests it can turn searing 600° engine

FRANK J. TAYLOR, *Californian by preference, is one of nation's top newspapermen. Recent book is "High Horizons"*

AIRESEARCH *recently opened new plant in Phoenix, Ariz. Company has 6,000 employees working here and Los Angeles*

EXECUTIVES *who, with J. C. Garrett (at desk), manage AiResearch are (left to right) W. R. Ramsaur, vice president-engineering; Mrs. Edith Williamson, secretary to Mr. Garrett; and M. S. Pelber, secretary of The Garrett Corporation*

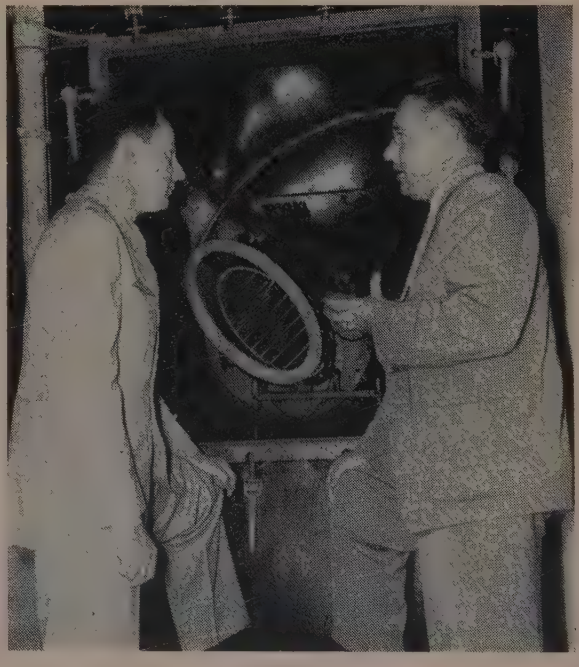
heat into snow. Garrett's engineers designed this miniscule cooler to keep our jet pilots from roasting in their cockpits while dogfighting over Korea. Ram heat, caused by friction of the air screaming past the surface of a plane, would turn the cockpit into an oven, were it not for one of these coolers, which has a cooling capacity of 35 household refrigerators.

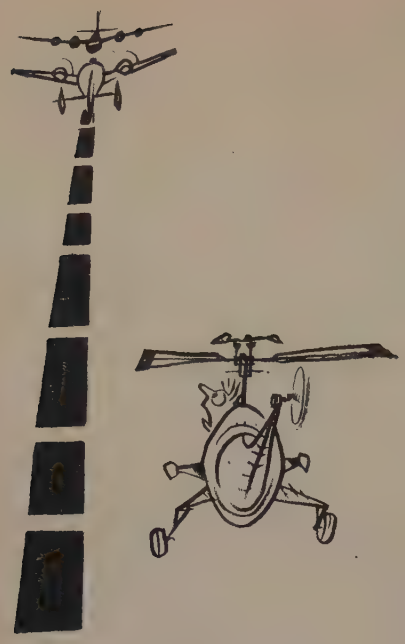
Another cooling problem confronted Garrett and his brain trust of nearly a thousand engineers. It arose out of the necessity for jet pilots to wear pressure suits to counteract the G's when they maneuvered planes at sonic speeds. Sweating inside their air-tight togs, pilots often landed with water up to their knees in their britches. Garrett's answer is a vest-pocket contraption, hitched to the pressure suit, which the pilot can switch on to cool and dry his inner clothing as he flies.

Keeping the pilot from cooking is only part of Garrett's worry, the easier part. At tomorrow's speeds, keeping the electronic equipment, the instruments, the fuel and lubricants, and even the plane itself from bursting into flame, as do some 400,000 meteors a year when they flash into the earth's outer air, is something else again.

"You just get one air problem solved and another bats you in the eye," he explains. "Designs are now on the boards for ships flying 2500 mph at altitudes up to 100,000 feet, where the outside temperature is minus 70°. At that point, skin friction temperatures alone may reach 1100° Fahrenheit. Adding other heat factors, (*Continued on page 56*)

HEAT EXCHANGER, *built by AiResearch, is topic of discussion between Mr. Garrett (right) and military representative*



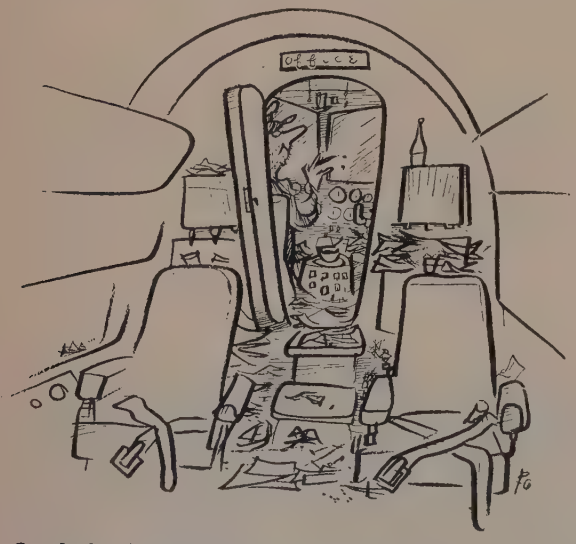


Performance

from the Files of the Flight Safety Foundation

Flight Procedures

It remains a sensible procedure whenever operating along a civil airway, regardless of your altitude, to keep to the right of an airway center line.



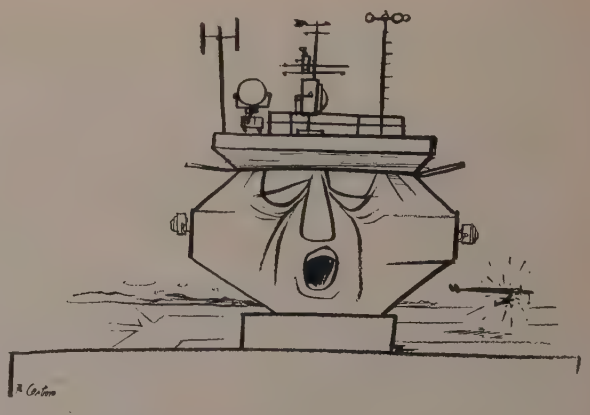
Cockpit Cleanliness

Inspections have shown cockpits littered with papers, gum wrappers, and debris, placards dirty and so "beat up" that they can't be read! Is there a receptacle in *your* cockpit to catch litter? Your cockpit is your office—its appearance to other crew members and passengers reflects how well you manage that office. Cleanliness may also have a practical effect; propeller control assemblies, removed because of malfunction, have been found to have been doused with coffee, cream and sugar, causing solenoid points to have been arcing—sooner or later causing primary latch to become inoperative—this *could* result in an in-flight reversal of propeller, or a blocking out reversing during landing.

Keep Tower Informed

A recent accident involving an air-carrier aircraft and a lightplane resulted in a fatality to the passenger in the lightplane and serious injury to the pilot. The accident was attributed to "assumptions" and a lack of explicit communications. The air-carrier plane had been cleared for a series of ILS approaches and had complied with the instructions from the Tower to report over the ILS outer marker inbound. The pilot of the air-carrier aircraft assumed that clearance was good for conducting a low approach across the airport. The Tower had not requested information from the air carrier as to its intentions, *i.e.* to conduct a low approach or to land, and had merely assumed that the flight would circle and land and in no way conflict with a lightplane which had just been cleared to take off.

As a result of these two assumptions, the air carrier on an ILS approach and the lightplane on take-off were on a near-collision course. The lightplane pilot, seeing the air carrier and thinking it was landing, tried to avert the collision by pulling up sharply to the left. His plane stalled, fell off into a spin, and crashed on the airport.



It's in the Head

An accident starts in somebody's mind. For a long time, safety engineers have been stressing that no accident is really a "freak." "Tricks of the subconscious mind" have been pointed out as the cause of accidents where a fatal left turn is made instead

PITFALLS

by Jerome Lederer and Robert Osborn

of an intended right turn, etc., under conditions of stress. Most safety engineers agree that this invisible factor causing a "trick" is *fatigue.* Fatigue can be mental, physical or a disinterest occasioned by lack of incentive. Fatigue does funny things to people. It may cause one to make slips of the tongue or it may lead another to make a slip of the hand—which brings disaster. It also causes forgetfulness. Don't let the "invisible factor," fatigue, interfere with your work.

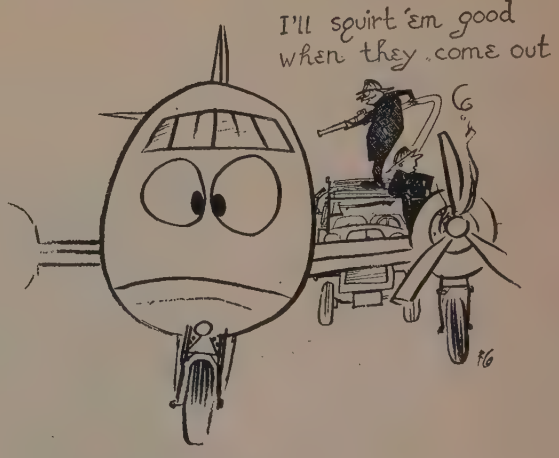
Emergency-Flight Detector

A pilot's nose can be a valuable item of equipment. A nose can be a sensitive detector of smoke (fire), smells (hazardous cargo leaking), and mechanical trouble (leaking connections, electrical arcing, etc.). Recognizing a strange odor can ease your mind or alert you quickly to a hazard so that the proper action can be taken. Know the difference between:

1. Cigarette burning on upholstery
2. Gasoline, alcohol, hydraulic fluid, exhaust fumes, oil, ozone
3. Fire extinguishent

Battery Explosion

Two batteries in a four-engine airplane exploded due to the emission of hydrogen gas in the battery compartment. The nature of the arc which set off the charge is unknown. Before the explosion, the batteries apparently had suffered a heavy volt drain, and the battery switch in the cockpit had been left in the "on" position, thus allowing the ground power unit to charge the batteries rapidly during the time the unit was connected. In this case proper operation called for the switch to be turned *off,* and not to be turned *on* until after No. 1 engine generator was operating.

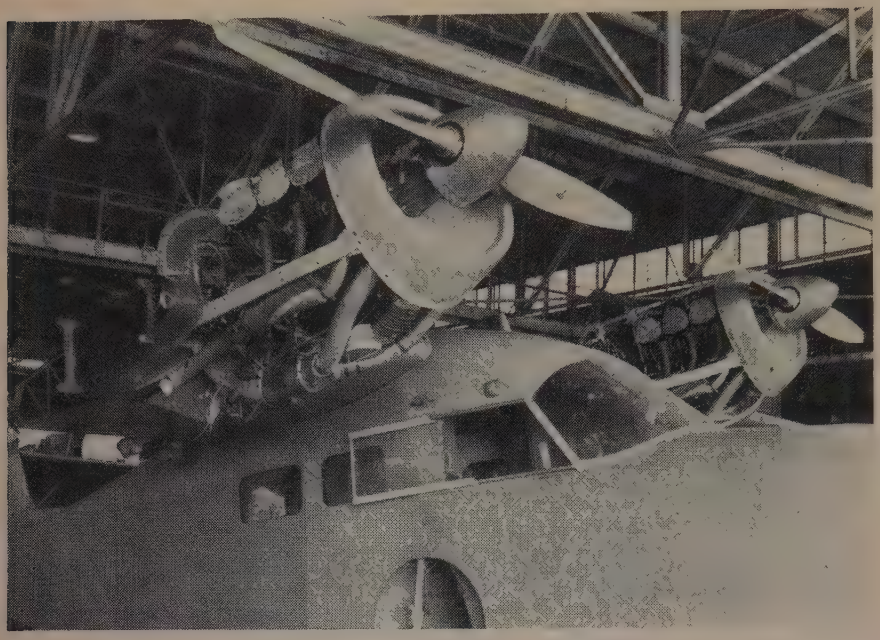


Fire Hydrant Parking

An air transport made a successful emergency landing, but to get its passengers out of the plane, an evacuation slide had to be used. Why? The fire engine that had hurried to the scene to "stand by" had parked in such a position as to prevent the opening of the transport's main door!

SKYWAYS FOR BUSINESS

NEWS NOTES OF PILOTS, PLANE OWNERS OPERATING AIRCRAFT IN THE INTEREST OF BUSINESS



INSTALLATION *of 260-hp Lycomings to replace Widgeon's 200-hp Rangers was done by Lockheed Aircraft Service at Burbank, Calif. The conversion provides improved performance, etc.*

Powerplant Modification Improves Performance of Grumman Widgeon

New York, N. Y. A powerplant modification for the Grumman *Widgeon* (first reported in SKYWAYS, November) has increased its power, improved its performance and provided a 500-lb increase in allowable gross take-off weight (to 5,000 lbs, land). In addition to the change in engines, from 200-hp Rangers to 260-hp Lycomings, the conversion provides for the latest type Hartzell controllable-pitch props that feature an emergency feathering mechanism.

A comparison of performance figures for the *Widgeon* with the Rangers and one with the Lycomings proves the value of the modification.

	Lycoming 260 hp	Ranger 200 hp
Max. speed @ sea level	187 mph	164 mph
Cr. speed @ sea level (75% power)	171 mph	150 mph
Cr. speed @ sea level (62½% power)	157 mph	138 mph
Cr. speed @ 6,000 ft. (62½% power)	164 mph	146 mph
Rate of climb @ sea level	1,750 fpm	1,000 fpm
Climb to 10,000	8 min.	15 min.
Serv. Ceiling	18,000 ft.	15,500 ft.
Take-off run @ sea level	640 ft.	895 ft.
Take-off run (glassy water)	16 sec.	25 sec.
Landing speed	63 mph	58 mph
Gr. Weight Land	5,000 lbs	4500 lbs
Water	4700 lbs	

As previously reported, the modification program was initiated late in 1951 by the Superior Oil Co. which commissioned Lockheed Aircraft Service to design the Lycoming engine installation for the *Widgeon*. Contrary to an earlier report, no fee is being asked to help offset original costs of engineering the change.

A few of the companies currently using the *Widgeon* are Superior Oil Co., Commercial Petroleum and Transport Co., Houston, Texas; McDermott Construction Co., New Orleans; U.S. Dept of Interior, Fish & Wildlife Service; Texas Gulf Sulphur Co.; Copano Oil Co. and Union Oil Co.

New De-Icer Fluid Developed for Air Transport Aircraft

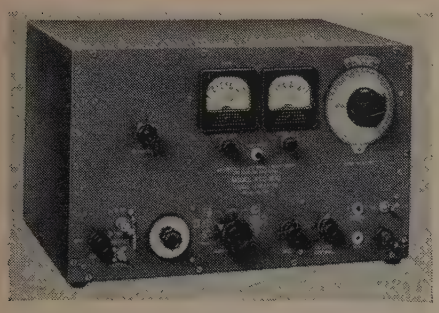
New York, N. Y. A non-inflammable type de-icing fluid has been developed for air transport use. Called "Stratofrost B," it was designed to eliminate the fire hazard of alcohol-glycol mixtures and to be many times faster acting. The product is reported to embody entirely new principles of ice removal and frost prevention. Manufacturer is Fine Organics, Inc., 211 East 19th St., New York 3, N. Y.

Portable Omnirange Test Unit Developed for VHF Radio Gear

Los Angeles, Cal. The American Electroneering Corporation has designed and is building a new portable omnirange test unit. This unit provides a simulated omni phase, ILS, and tone ILS signals for laboratory or ramp test of airborne VHF and navigation radio gear. The set checks omni bearings continuously variable from 0° to 360°, and assures accuracy to 1°. In addition, it will check left-center-right, and up-center-down on 90-

INDIANA GEAR WORKS *John Buehler (right) and Roscoe Turner, president of Roscoe Turner Aeronautical Corp., make final check of work done on Indiana Gear Works' Twin Beech*

150 localizer and glide slope. A self-contained, regulated dual power supply utilizes either 105-130 volt AC 60 cycles, or 22-30 volts DC at 5 amps. The unit is called "ILS Signal Generator" Model AEC-200. The Los Angeles Electroneering Corporation is located at 5025-29 Jefferson Blvd., Los Angeles.



MODEL AEC-200 *is new portable omnirange test unit developed by Electroneering Corp.*

Corporations Buying More Aircraft for Executive Operations

New York, N. Y. Private ownership and operation of large transport aircraft by industrial corporations is a growing factor in the transportation system of this country. This was brought out in an announcement by Mr. Joseph T. Barta of the New York firm, William C. Wold Associates, which conducts an international clearing house for transport aircraft.

In announcing his company's recent sale of a Douglas B-23 to the General Electric Corporation, Mr. Barta said, "This is the 63rd transport plane sold by our firm within the past two years. Although the number of our sales of airplanes has been increasing during the last year, the sales to private corporations for executive transport for industrial aid is still the larger part of our business, accounting for about 85% of our sales."

The Douglas B-23 is a long-range conversion of a World War II bomber. About 20 are today in use as executive transports.

United Air Lines Building First Drive-in Ticket Office in S.F.

San Francisco, Cal. United Air Lines is about to open what it calls "the world's first drive-in ticket office," approximately 30 miles south of San Francisco on El Camino Real, main highway between San Francisco and outlying Peninsula communities.

The roadside ticket office will be a white, arched roof structure, glass-walled on two sides and trimmed with brick and native wood. It will have two windows for drive-in service, enabling motorists to pick up tickets while seated in their cars. The interior will have a redwood counter, chairs, etc. Canopied parking space will be provided for motorists seeking detailed flight information.

Choice of location for the drive-in was determined by surveys which showed that almost 50% of United's passengers from the San Francisco area live in suburbs south of the city municipal airport.

. . . in the Corporate Hangar

Ralph Whitworth has been named chief pilot of The Coca-Cola Company's executive DC-3, presently undergoing conversion at Beldex Corporation in St. Louis.

Goodyear Tire & Rubber Company's *Lodestar* is in the hangar at AiResearch for overhaul and installation of a dual fuel system. Company pilots Charles Reeder and Don Kinsell are overseeing the work. Home base for Goodyear is Akron, Ohio.

The Grumman *Widgeon* owned and operated by Rowan Drilling Company at Fort Worth, Texas, is undergoing a complete overhaul at Southwest Airmotive. All fabric surfaces are being recovered.

Sprague Electric Company of North Adams, Mass., has its Twin Beech back in operation after 1,000 hour inspection at Atlantic Aviation's Boston hangar at Logan Airport. Bob Sprague Jr. took delivery of the plane, and his *Bonanza* is scheduled next to go into the shop for an engine change and relicense.

Bridegroom Bill Pollard and Carl Siemer, copilot and pilot of the Trailmobile *Lodestar,* stopped off at Southwest Airmotive's base recently for a short visit. The boys were enroute to Atlanta, Georgia, from their headquarters in Cincinnati.

Commonwealth Motors, Inc., of Richmond, Virginia, has purchased an executive Twin Beech from Powers & George. The D-18-S formerly was owned by F. L. Jacobs Co., Detroit.

Buck Newton and Bob Baltese, pilots for Pittsburgh Plate Glass Co., brought their plushed-up DC-3 to Remmert-Werner for 100-hour inspection.

Atlantic Aviation has the *Bonanza* belonging to Pierce's Hatchery, Brooklyn, Conn., in the hangar for an engine change, radio work and installation of a Beech shoulder harness.

Gaylord Container Corporation's *Bonanza* is in the Remmert-Werner hangar at St. Louis for an engine change. A member of CAOA, Gaylord Container Corp. bases this *Bonanza* at its Bogalusa, Louisiana, operations center.

Mini Grande Oil's executive DC-3 is at Southwest Airmotive for a complete overhaul. Red Erwin, copilot, spent some time at SAC during his vacation to work out arrangements for interior changes in the Mini Grande plane.

Ray Miller, pilot of the Mark Hurd Mapping Co. B-17, brought the plane to AiResearch at Los Angeles for a complete overhaul. Home base of the converted B-17 is Minneapolis, Minn.

Ed Elliott, Harold Eliot and Mike Sander, crew of the Goodyear Aircraft Corporation DC-3, brought the plane back to Remmert-Werner for installation of a Collins Integrated Flight System, new radio, new plastic edge-lighted instrument and radio panel, and renovation of the crew's "front office."

Cliff Conrad and Dale Marrs, crew of the Pan Am Southern Corporation's executive DC-3, have been at AiResearch supervising work on the aircraft's engines.

Southwest Airmotive has cleared the decks for Tommy Neyland's arrival with Trostel and Sons' *Bonanza.* The company *Bonanza* is in for a check and will be followed by a 100-hour on the Trostel and Sons' B-25.

CAOA report

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the members firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. CAOA headquarters are located at 1029 Vermont Ave., N. W. Washington 5, D.C. Phone: National 0804.

Phenomenal Growth of Corporation Flying

One of the most amazing developments during the past few years, is the swift and unhesitating acceptance of the private airplane for industrial and business use. By purchasing aircraft, many large and small corporations have indirectly angled into the aviation field and they are finding it unusually beneficial to their over-all business prosperity. Perhaps the most important asset, offered by corporation-owned and operated aircraft, is the saving of time for top executives. They are able to be in and out of off-airline airports quickly and comfortably most of the time. In many instances, the geographical and physical location of various organizations enables them to substantially reduce travel costs by transporting personnel in their own aircraft.

Generally, it is the initial cost of purchasing and maintaining an airplane, hiring a pilot, and defraying operation costs that deters some organizations.

Although executive aircraft were winging the sky lanes over 25 years ago, this segment of civil aviation didn't begin to mushroom until just after World War II. At that time, hundreds of surplus aircraft were quickly and cheaply bought by corporations that saw the advantages of executive flying.

Whatever the reasons, it is now obvious that corporation flying is here to stay. The corporate aircraft fleet today numbers over 9500, or nearly one sixth of all civilian aircraft throughout the nation. During 1951, corporate aircraft flew more hours than the domestic scheduled air carriers and had a total of passenger seats in excess of those of the airlines. Such everyday use—under all conditions of weather—is winged evidence of industrial adaptation of the air age to its own needs and purposes. This is as it should be, for the rapid growth of American industry has depended largely upon technological developments.

It is CAOA's hope that more industrial and business enterprises will recognize the remarkable advantages of being able to fly where they want to when they want to with a minimum loss of time and expense.

Pictorial Computer Developments

As a visual aid to air navigation, Sperry Gyroscope Company, a member of CAOA, has developed a pictorial computer which can be mounted on the instrument panel of executive aircraft. The display is 10 inches in diameter and the airplane position marker indicates both heading and position. This equipment will function both as a pictorial computer and course line computer.

Another type of computer is under development by the Arma Corporation which will utilize a projection system to present the chart on a screen. A 35-mm roll film will be used for the projection and the instrument will accommodate 700 charts.

A portable type of computer has been developed by Aero Electronics Co. A modified version of this computer will feature a spot-of-light type of position indicator and a scroll-type map magazine.

The Coast and Geodetic Survey agency of the Department of Commerce has cooperated with the manufacturers in the design of special charts for the pictorial computers. Approximately 6,000 charts have been printed on heat-sensitive chart paper, and include stations from Chicago to New York; Boston to Richmond; and Washington to St. Louis.

CAA Issues Report on Aviation Fuels

Use of automobile gasoline in any aircraft engine is not advisable, according to a report on engine fuels and lubricating oils recently issued by the Civil Aeronautics Administration, U. S. Department of Commerce.

"Motor gasolines differ materially in composition and volatility from aviation gasoline. The anti-knock value of motor fuels is not standardized and may be inadequate. In addition, most motor fuels contain much more lead than is desired for the operation of low-powered aircraft engines."

These factors may result in improper operation and in excessive spark plug fouling, ring sticking, and valve trouble. Another important point is that there is a greater tendency for motor fuels to cause vapor locking of the aircraft fuel systems. The higher the fuel temperature and the altitude, and the greater the vapor pressure of a fuel, the greater the tendency of a fuel to form vapor.

"The use of automobile gasoline is inadvisable and may even introduce a critical hazard," the report warns.

Purpose of the 10-page report is to present significant information concerning aircraft engine fuels and lubricating oils, and to outline acceptable procedures for CAA evaluation of the suitability of such products. Some engine operational problems of light aircraft involving fuels and lubricating oils also are discussed. Throughout the report emphasis is placed on the practical rather than the theoretical aspects of the subject.

Copies of the report, entitled *"Evaluation of Aircraft Engine Fuels and Lubricating Oils,"* may be obtained without charge from the Office of Aviation Information, CAA, Washington 25, D. C., by requesting a copy of Aviation Safety Release No. 363 to which the report is attached. The report was prepared by the Power Plant Branch, CAA Office of Aviation Safety.

This report has been reviewed by National Headquarters and it is considered valuable information for corporation pilots.

Stewardesses Available for Executive Flying

CAOA National Headquarters received the other day an interesting and provocative letter from a Stewardess Training School advising that their graduates were ideally trained for positions with large corporations operating multi-engine aircraft. It was pointed out that these girls—very trim and pretty ones, too—were thoroughly trained in

MICHIGAN-WISCONSIN PIPELINE CO., *members of the Corporation Aircraft Owners Association, own and operate an executive DC-3. It was a recent visitor at Teterboro Airport*

SHELL OIL CO., *a CAOA member company, operates a Grumman Mallard for both transportation and utility work in the Dutch East Indies. Oil-field searching is one of its chores*

emergency equipment and procedures, international and domestic documentation, first aid, and were eager to be of service to executives who desired maximum comfort in their frequent air travels.

If any CAOA member or non-member is interested in securing the services of these capable young ladies, please drop a line to the Executive Director. Perhaps some of the corporate aircraft operators already have employed a stewardess in connection with their flight activities. If you have, let us know. If not, it is indeed a novel idea.

For those corporation pilots interested in specifications of the graduates, here are the facts:

a. Between 20 and 27 years of age.
b. Between 5' 2" and 5' 8" tall.
c. Weight between 110 and 135 lbs.
d. Have excellent health and eye sight.
e. Have a very pleasing personality.
f. Are adaptable and versatile.

What more can be asked?

Collins Integrated Flight and Approach Horizon Available

The Collins Radio Company, Cedar Rapids, Iowa, has just completed an evaluation test of the Collins Integrated Flight System and Approach Horizon. The tests consisted of 100 instrument approaches made at 10 different airport sites in the Midwest. The purpose of these tests was to evaluate the Steering Computor Course Indicator and Approach Horizon under simulated instrument conditions. Approximately one-third of the approaches were made with direct crosswinds varying from 15 to 30 mph, and in very rough and gusty air, each approach was recorded on a chart with suitable electronic apparatus. At the end of the tests all approaches were summarized.

Results show that in 70% of the total approaches the airplane was less than 20 ft. off of the center line of the runway as it passed over the approach end of the runway; on 87% the deviation was less than 30 ft.; and 95% were less than 50 ft.

This equipment is now available to the users of corporation airplanes, and the performance being obtained with this equipment will undoubtedly develop a considerable market in this segment of aviation.

Motion Sickness Booklet

Recently, National Headquarters received a booklet entitled *"Studies in Motion Sickness as Related to Commercial Aviation Medicine."* It contains interesting information on all aspects of this subject. Copies may be obtained from G. D. Searle & Company, Chicago 80, Illinois.

Visitors at CAOA Hq.

Mr. A. M. Haase, USNR, Pilot
San Francisco, Calif.

Mr. Lee Balestra, Pilot
Brown Graves Co.
Akron, Ohio

Mr. Don Miller, Copilot
Brown Graves Co.
Akron, Ohio

Mr. Louis A. Sefranex, Flight Instructor
Mayland Flying Service
W. Hyattsville, Md.

Mr. and Mrs. Marvin C. Staddon
L. B. Smith & Co.
Camp Hill, Pa.

Mr. Ralph E. Piper, Pilot
Monsanto Chemical Co.
St. Louis, Mo.

Mr. Aaron E. Spotswood
Monsanto Chemical Co.
St. Louis, Mo.

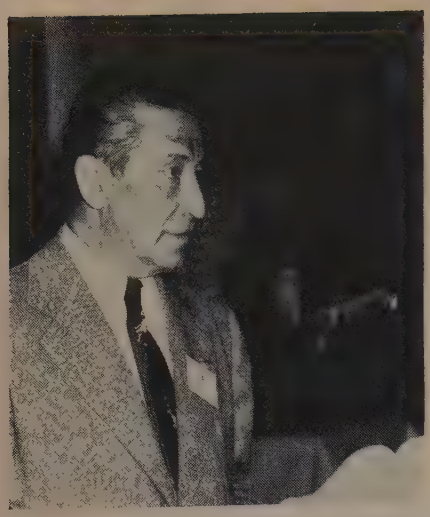
Mr. H. E. Weihmiller
Aircraft Consulting Service
Washington, D. C.

Mr. Forest R. Conover, Ch. Pilot
Ideal Cement Co.
Denver, Colo.

New CAOA Members

1. National Lead Company
   New York, New York
1. The Gardner Board and Carton Company
   Middletown, Ohio
3. Reynel Corporation
   Sterling, Illinois
4. Cessna Aircraft Company
   Wichita, Kansas

LODESTAR, *owned and operated by Lear, Inc., features a TV set installed in forward bulkhead. Passengers aboard Lodestar report reception to be excellent. Set is a Sentinel*



SPEAKER *at Forum was Max Balfour of Spartan. He talked on availability of pilots*

CAOA

fifth annual forum

DATA *Administrator, Gen. Ireland, discussed role of corporate aircraft in war emergency*

The Corporation Aircraft Owners Association, listing among its many members the leading companies and corporations operating aircraft in the furtherance of business in the U.S., held its Fifth Annual Forum at the Hotel Blackstone in Chicago recently. This Annual Meeting was by far one of the best CAOA has held. Its members came from about every state in the Union and its guest-attendants represented leading aircraft and equipment manufacturers as well as pilots and aviation department heads of companies either new to CAOA or about the make applications for membership.

Guests speakers at the Forum, which opened Friday morning, October 3 and which was presided over by Cole H. Morrow, Chairman of the Board of Directors of CAOA, included Maxwell W. Balfour, vice president of Spartan Aircraft and the Aeronautical

PRE-LUNCHEON *gathering brought together (left to right) Randy Mulherin, Chief Pilot for Crane Co.; Paul Butler, popular head of Butler Aviation; Herb Fisher of the Port of N.Y. Authority; Jean DuBuque, Executive Director of CAOA; Donald Nyrop, Chairman of the Civil Aeronautics Board and one of CAOA Forum speakers; and Harvey Gaylord, Chairman of Helicopter Council of AIA, and a speaker*

CAOA BOARD CHAIRMAN *Cole H. Morrow (left) joined Maxwell W. Balfour and Miss Earlene Wallace for a pre-meeting visit at the Forum*

CAOA REPRESENTATIVES *George Wies of Sperry Gyroscope Company and Randy Mulherin get together for a chat at the pre-luncheon party*

Training Society; Brigadier General Ray W. Ireland, Administrator of the Defense Air Transport Administration, U.S. Department of Commerce; Harold Crary, vice president of Sales, United Air Lines; Dr. F. L. Flack, Chief Surgeon, Sinclair Refining Company; Donald Stuart, Director, CAA's Technical Development and Evaluation Center, and Harvey Gaylord, vice president of Bell Aircraft and general manager of its Helicopter Division. The Honorable Donald Nyrop, Chairman of the Civil Aeronautics Board, was the guest speaker at the luncheon on Friday.

Following the luncheon and a talk by Mr. Nyrop on the CAB's view of corporation flying, a tribute to Cole Morrow for his ceaseless and untiring efforts in behalf of the Corporation Aircraft Owners Association was read into the record by Henry W. Boggess, head of the Aviation Department of Sinclair Refining Company.

SPERRY MEN *Frank Breen (left), Bill Dooley discuss corporate use of their equipment*

CHAIRMAN *Cole Morrow (left) and Henry W. Boggess (right), Director Aviation for Sinclair Refining Co., talk over excellent safety record of corporate aircraft with one of attending exec pilots*

CAB SPEAKER *Donald Nyrop (center) shares a laugh with Cole Morrw and, apparently, in the direction of the questioning Herb Fisher. In his talk, Mr. Nyrop praised Association for its safety record*

report on FARNBOROUGH

by Christopher Clarkson

former Civil Air Attaché

Interest high in propjet transports and new delta jet bomber at SBAC Display in England

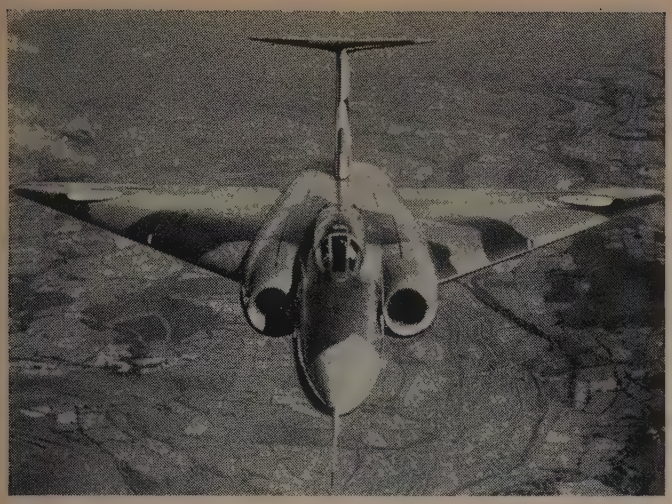
▶ *Special to Skyways*

At the end of every Society of British Aircraft Constructors Display at Farnborough one is inclined to think that the next year, anyhow, it can't be quite as good or quite as interesting. But every year it is. It is true that in some years there are outstanding aircraft or outstanding flying displays by particular pilots—such as in 1949 when the De Havilland *Comet* and Vickers *Viscount* first appeared, and altered everyone's idea about turbine engines in commercial transports. But looking back over the years, each Display keeps up the high standards set by those before it, and although this is partly due to the fact that each year there are some new turbine aircraft to hold the attention, it is a remarkable feat and reflects great credit both on the British Aircraft Industry and its Society. This year, despite the tragedy on one of the public admission days, was no exception. And one hopes that the visitors, 4,000 of whom came from abroad and some 800 of whom came from the United States alone, thought so too.

For the benefit of those who have never been to Farnborough, it should be explained that it is a huge affair, probably the biggest display of its kind ever held anywhere in the World. It is divided up into three parts: A static exhibition of British engines, equipment, accessories, radio, armament, ground facilities and the like, which are all housed in one huge tent by the side of the main runway; a ground display of aircraft, about half of which takes part in the flying display; and the flying demonstrations themselves. Nearly all aircraft are open to examination by the visitors, but there are generally one or two types which are still on the secret list and which are housed in another —and restricted—part of the field. These planes are only seen in the air. It is all a pretty serious business. There are no bands marching or drum majorettes parading, or speeches by prominent people (the only speeches are at the annual dinner on the opening night). But there is a running radio commentary during the flying. Members of the Society apart from their exhibition stands have caravans parked in a reserved section of the display area, and these serve as meeting places for visitors and friends, so that the whole show tends to have a social as well as a commercial atmosphere. For the first four days, admission is limited to members of the Aircraft Industry, foreign visitors, and the Press, and this year these invitations totalled over 40,000 people. Ladies are not admitted unless actively engaged in some branch of the Industry. The last three days are set aside for the paying public. This year some 305,000 people paid for admission.

The first of these Displays was held in 1932, and over the years the organization of both the Static and Flying Sections has steadily improved. It is this continuity (except, of course, during the War period) which has given this show its strength and stature. It is now so large that it is impossible to give a blow-by-blow description of every exhibit and every aircraft, for there were some 213 stands and some 55 aircraft on display. Of these, between 30 and 40 flew demonstration flights. Many have already been described in detail in the American and British press. Nevertheless, there seem to be something of interest on almost every stand —ranging from engines and propellers to nuts and bolts, from models of things to come to photographs from the past. And it was interesting to watch where the crowds

TURBOPROP *Vickers Viscount (below) and Bristol Britannia thrilled crowds with quiet-flight demonstrations. Viscount may see service soon*



GLOSTER *Javelin, an all-weather day/night fighter, is on order for RAF; is considered "the most powerful fighter of its kind"*

AVRO 698, *heavy duty delta bomber, startled onlookers with its slow-flying demonstration. It is also one of RAF's fastest bombers*

surged most thickly around the exhibits, as it gave an indication of which developments —or even which companies—people thought most interesting or most progressive. Although there were certain countries which were not invited, languages and uniforms of every nation (and particularly NATO nations) were everywhere—and if at the end of the day the Public Relations officers, the foreign sales managers and the stand representatives were exhausted and talked out, it certainly looked as though their efforts were worthwhile. There was, too, another and more tangible side to it all. Here, gathered together in a comparatively small area, was a cross-section of a major world industry—designers, builders, operators, Air Forces officers. These at that very moment could hold some of the keys of World peace and of World progress. If, in the turmoil and the pleasure of meeting hundreds of one's friends, one had time to think about it, it was an impressive, if sobering, situation.

But to get back to the flying. Unless one has stood near a low-level high speed run of a modern jet fighter, doing perhaps 700 mph, it is impossible to appreciate the impact of noise and speed on the human body, for it is an actual physical impact. Yet after having seen several such runs, and watched the incredible climb that generally follows, one does become a little blasé, and almost glad to find relaxation in some new form of aircraft, or in some new look, or in the quietness of the modern propeller-turbine transport. It was so at Farnborough. The novelty of the terrific speeds and accurate aerobatics has, to those of us who see it every year, worn off, and it was to such aircraft as the Avro *Delta* bomber, or the Bristol *Britannia* that one turned for a new thrill. So, because it is these types that may make history in the coming years, a very brief impression of them—given in the alphabetical order of their manufacturers—should be given.

The Bristol *Britannia* is first on the list. Although conventional in appearance, it is a larger aircraft than it looks both on the ground and in the air. It is a 50-104 seater of 140,000 lbs. all-up weight, powered with four Bristol *Proteus* engines, and is to this year what the *Comet* was to 1949; in other words it, too, is a prototype of things to come. In the air one of the most outstanding things about it is its extraordinary quietness. This results from the combination of turboprop engines and the large comparatively slow-revving propellers. Particularly striking on this, the first machine, was the general excellence of the finish, particularly the smoothness of the paneling. Furthermore, if current reports on the economy of the *Proteus* III engines are fulfilled, this should prove a remarkably efficient aircraft and, having been designed as a turboprop-powered machine from the drawing board up (rather than being a conversion from a piston-powered type), it should set a high standard in its field. More particu- (*Continued on page 54*)

BRISTOL 173 *helicopter flew well and is said to be "first twin-engine, twin-rotor commercial helicopter" to fly. It seats 10/12 passengers*

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Skyways Round Table

(*Continued from page 25*)

. . . . they began to put switches on it; they began to put general information on it. Then they began to put bulletins on it. That T-head grew and grew until now the canopy surrounds this Christmas tree that has grown in the pilot's cockpit.

"One parting remark is that I think there is a great omission in our military mock-up boards. These boards are always composed of experts and experienced test pilots. I think it'd be a good idea to get some of the cadets and ask them how things stack up. They might give us a better idea of the problem of converting information into action.

"I'm delighted to have the chance to be here this afternoon and to express my hope of development in this line and suggest a direction. I've been working in this field for a long time and I believe that this getting together of people, as SKYWAYS has done here, to discuss these problems informally is going to do a lot of good."

Charles Colvin: *"We have a subject here which has a depth of interest that goes far beyond the instrument manufacturer or the control manufacturer. In fact, it seems to me that it affects everybody that has anything to do with airplanes: the airlines, the military, the pilots as people rather than as part of an organization, the manufacturers of airplanes and equipment, and the Government organizations: the Munitions Board, the CAB, the CAA, etc.*

"To get the airline point of view, I'm going to ask Charlie Froesch what he thinks should be done."

Charles Froesch (*Vice Pres.-Engineering, Eastern Air Lines*) "I can't give you opinions as a pilot, but I can give you a few thoughts as an engineer. Just as Adm. de Florez has pointed out, the thing that has been worrying us for the past several years is the complexity of the cockpits. A primary problem today is where to put all these instruments we are getting in a cockpit that already is lacking in space. The second problem is how to arrange the instruments so that they can be quickly and easily read. Most of the pilots who fly our largest airplanes are older and experienced pilots. Their mental reflexes are not as quick as the younger pilot's and, therefore, we have to build a greater degree of functional order in the cockpit. We certainly don't have it today. The third problem is instrument lighting. Very little has been done on that. Most of our cockpits are still lighted today the way they were 20 years ago, and that presents an element of fatigue which must be overcome. We have done some research along that line, but we don't feel that we have the answer. The fourth problem is that most of our instruments are getting to be electronically operated today, and we find ourselves in a difficult position trying to find places for all of those black boxes. Those are the four major problems which we have in the design of airplanes today."

Charles Colvin: *"Dan Beard, what is the thinking of American Airlines on this matter?"*

Dan Beard (*Chief Engineer, American Airlines*): "I would probably be one of the poorest members to put on a cockpit standardization committee. Like most of the early birds, I like to do things in my own way and in the past I have disagreed with everybody else about as vehemently as any other pilot ever did. Most pilots disagree with each other on the way they want things. At one station in my life I was an active test pilot and I enjoyed flying four or five different models in one day. I think all active pilots, military and civilian, develop the facility of handling a number of different types of aircraft in a short time with little or no difficulty, despite the fact that one cockpit is entirely different from another.

"It wasn't until I got into the airline end of aviation that I began to see the light; that if you have a large number of airplanes, all having about the same service to perform, that standardization, functionalization and simplification have merit.

"Until we started operating DC-3's on American Airlines, the airline was equipped with about as miscellaneous a group of airplanes as any other airline of our size. There was no chance of standardization because we had so many different models. But with the advent of the DC-3 fleet, we got rid of everything except the DC-3's. And we soon found that our DC-3's were not standard. A lot of engineering changes were being made and there were various and sundry controls in the cockpit and gadgets on the airplanes which were non-standard. Unless you had a very large shop and a small fleet, it was impossible to get the changes made all at one time. One of our accidents on a DC-3 was caused during a period of change. We were changing over the fuel system valving. Information of the change had gotten out to the field, but the crew of this particular DC-3 had not received the information before they got into the plane. Fortunately, there was no fatality, but the accident might have been fatal. That impressed on everyone the necessity of more uniformity in the fleet and fewer non-standard gadgets. It meant that we had to analyze mechanisms more carefully before we put them on the airplane for even service tests.

"In 1936 we went to the DC-4 on a five-airline agreement. Douglas, who was to build the airplane for us, had a great deal of trouble getting the five airlines to agree on many items and arrangements. The first DC-4 was a compromise between the thinking of five airlines, and the configuration established in that cockpit finally came into operations in the C-54. After the war the DC-4 was flown by the airlines as a modified C-54. The flight engineer's configuration that is used domestically on the airplane stems from the uncertainty between the five airlines as to whether they wanted a bonafide flight engineer's station, or whether the DC-4 could be operated with a crew of two. They finally compromised on a cockpit in which all essential controls could be reached by at least two pilots in their seat and the airplane could be safely and efficiently operated by a crew of two. Or, if a flight engineer was desired by any operator, he would sit between the pilots and could reach whatever controls he needed to use as a flight engineer.

"We came then to the DC-6. In order to get the DC-6 out fast (it was a military model to begin with), the military insisted that whatever could be lifted from the C-54 should be put into the DC-6. It was the XC-112 at that time. So the DC-6 configu-

ROUND TABLE *dealing with cockpit simplification and standardization was held at Wings Club, New York. Participants, representing airlines, military, CAB, manufacturers, numbered 16*

MATS REPRESENTATIVE *was Lt. Col. Tom Collins (second from left). To his right is LeRoy Stoner; to Lt. Col. Collins' left are H. F. Penfold, Robt. Garrett, Charles Froesch, O. E. Tibbs*

ration pretty much stems from the DC-4. If the war had continued and the DC-6 had come out as a military model, the cockpit would have looked almost like the DC-4. However, after VJ day, the military released the model and the airlines then changed the configuration as they desired.

"United and American being together on the project, we agreed on the cockpit arrangement, and when we first brought out the airplane, the United and American versions were identical in the cockpit area. But I was very surprised about a year later when I got a United cockpit and found how far we had digressed from the standardization that existed when the airplane first came off the production line at the factory. It was a surprise to me to see how the philosophy that had existed when we were jointly working on the airplane should have changed in just 12 months."

Charles Froesch: "Do you remember when the DC-4 was first started in 1936? There were about 10 airline pilots who got together and it took them about a month to decide on a standardized cockpit. All the DC-4's were built with that cockpit layout. Yet, today, when you take a look at the DC-4's on every airline, each one has a different instrument board. Yet the same people fly the airplanes. What can we do, psychologically or physiologically, so that everybody can think alike? Surely there isn't that much difference in human beings."

Dan Beard: "I have always thought that in any given stage of development, there is a degree to which we should apply standardization. We don't want to stifle ingenuity in development. Standardization should come at some stage of development where enough originality in development work and thought and ingenuity have been exercised to have brought out a series of best ways to do things, and to eliminate the poor ways. When the best configurations are evident, then is the time to standardize, if possible."

Col. Joseph Boudwin (*Chief, Technical Branch of Reports Div., Office of Inspector General, USAF*) : "Dan, if we do standardize, what is going to prevent the various airline operators from making changes a year later? It's possible that they might rearrange the standardization after they get the aircraft. Mr. Froesch recalled some years ago that 10 pilots got together and agreed on a setup, and then a year later it was all change. How can we prevent that from happening even if we start out with a standard cockpit?"

Dan Beard: "About two years ago, the Air Transport Association was up against the problem of standardization, forced by the emergency of the Korean War and the necessity of getting transport planes so that, in the case of a national emergency, the national airlift could be pooled: pilots and airplanes. There was the need for uniformity, especially on those items which were thought to be necessary for safety's sake, namely, the instrument panel. The ATA decided that the Society of Automotive Engineers had had long experience in commercial standards and had many committees working on the standardization in many fields. The ATA requested the SAE to take the project, and Ray Kelly, vice president of the Society's aviation activities, was given the job of finding a chairman for such a committee. Much to my astonishment he called on me and asked if I would take it over. At that time I wasn't at all sure I was exactly suited for such a job, and I took it with some misgivings. I had talked to several friends about it and was told I was barking up the wrong tree, that it would lead to no useful purpose in the industry. However, I decided that standardization would come eventually and that if our organization was not satisfied with whatever standards were arrived at, I'd have no one to blame but myself. Also, someone had to do the job. I felt the job had to be done by men who had experience, background, knowledge and judgment to do a job of that importance. I knew a number of men in that category but I didn't know if they could devote the time to it. I wrote to those men and got a unanimous response. The membership of SAE Committee S-7 included O. E. Tibbs of Glenn L. Martin, Capt. Scott Flower of Pan American, Fred Davis of Eastern Air Lines, Blake Cahill of Northwest, Chris Christenson of United. Portman of ALPA did instrument panel work. There was John Fornasero of Boeing, Rudy Thoren of Lockheed, Bert Foulds of Douglas, Jack LeClaire of TWA, Ted Haueter of Continental and Art Bussey of Consolidated.

"The industry really wanted a standard instrument panel. The Munitions Board and ANC-16 that came before the Munitions Board had worked on standardization, and I had been attending their meetings by invitation for a couple of years. They had done some pretty good work, and I knew how hard it was to draw out from a group of men a set of coordinated ideas that would all boil down to a standard. Having worked twice on previous committees that had been set up to see what could be done about the instrument panel, I decided the best course to take was not to start on the panel, but to get the idea of standardization going by working on several easier projects to standardize.

"So we started out with sub-committees working on cockpit lighting and cockpit controls and visibility. Scott Flower headed up the cockpit lighting panel; Rudy Thoren was head of the subcommittee on cockpit controls; Jack LeClaire on visibility and Chris Christenson worked as chairman of the panel on warning lights and signals. I took the chairmanship of the instrument panel group.

"To date, we have brought out recommended practices on cockpit and instrument panel lighting. The SAE has already distributed this ARP to the industry and we have received favorable comments on it. It will remain in Recommended Practices status until such time as the SAE governing board thinks that it is in such a form that it can be made a standard. In the same category is the Recommended Practices on cockpit controls. Visibility is in the lower category of 'Information Report.' Inasmuch as the dimensions have not been mocked up and thoroughly checked as yet, we are not certain about some of the dimensions and clauses in this document. We decided it would be advisable to gain more experience through industry trial before it becomes a Recommended Practice. Nevertheless, it combines the best thinking of several agencies and we think it will serve the immediate purpose of guiding the next group of cockpits under design.

"The recommended practice on controls has had wide coordination with the Munitions Board and with all of the people doing work along that line. The manufacturers helped us a lot on this standard as they had so many designs, past and contemporary, from which to draw experience and conclusions. The recommended practices are not too binding—they leave a certain amount of leeway wherever leeway is required for dimensional configuration of the cockpit. The

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SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Skyways Round Table

(*Continued from page 39*)

locations of controls, however, are pretty well fixed so that a pilot who wants to go to a certain control will know where to find it in any cockpit.

"Of necessity we took up the instrument panel earlier than planned. The Korean War was on and early experience of pooling DC-4's and pilots from many airlines for the Korean Airlift indicated clearly the necessity of getting a standard instrument panel in the event of an all-out war when all four-engined transports might be pooled. Also, the purchasers of the Martin 4-0-4 and the Convair 340 were up against having to put in the already issued Munitions Board panel unless the industry recommended a standard panel. It was clearly evident that unless Committee S-7 came out with an acceptable standard panel, in the event of national emergency the Munitions Board panel would be the standard panel for all pooled airplanes. Each airline has adopted a fairly standard panel which is used in its own system on all their models. The industry felt that to inject still another panel into each system, would be a very dangerous thing, such as would be the case with the Martin 4-0-4 and the Convair 340. The CAB recognized the validity of this position and allowed each airline to have its own standard panel in the Martin 4-0-4 and the Convair 340, provided the industry would recommend a panel that could be brought out as a national standard for use in the event of an all-out war.

"Committee S-7 tried to meet a January '52 deadline, but the time available and the amount of work that had to be done did not permit us to get it out by January. Mr. Nyrop then allowed us until April to get out the standard panel. We met that deadline for issuing a panel proposal. However, the industry had not been able to comment on it by that time.

"We wanted to present the panel to the Chief Pilot's meeting at the ATA conference in July to get their comments. Unfortunately, ATA had so much on its agenda that the standard panel was not formally presented. Each chief pilot, however, now has a copy of the proposal and we hope to have their comments soon.

"In working out the instrument-panel problem, we tried first to standardize on all of the instruments that might go into the panel. It looked like a conglomeration that was impossible, so we asked Collins, Sperry and Pioneer to demonstrate their various computer instruments. The CAA loaned their facilities at their laboratory in Indianapolis and we had a two-day demonstration by the various manufacturers and the Air Force from Wright field, so that each member of the committee would definitely understand how each computer-type of instrument in groupings are supposed to be used. After two meetings, we managed to come up with four groupings of instruments which represented various stages in the instrument-combination uses. One was a straight ILS panel that was basic for instrument work. Another one was a combination of ILS and RMI; the third was the Collins grouping, and the fourth was the Zero Reader grouping.

"To arrive at a standardization on those seemed almost impossible, but nevertheless, we did manage to come up with five panels, all of which looked pretty good. Then that finally boiled down to two pretty good panels, each incorporating the four basic groupings. The upshot of it was that when we got through with the panel for the ILS or basic system, it looked very much like the Munitions Board standard panel. We changed a couple of instrument locations and the Munitions Board shifted a couple of theirs and that is the panel that has now been offered to the industry as the recommended standard national panel.

"Answering Joe Boudwin's question as to what would prevent the airlines from changing over: at the meeting at the recent CAB annual review of regulations, the consensus of all agencies attending that meeting was a recommendation that the CAB adopt Committee S-7's recommended practices wherever they apply to the regulations, but not to expand the regulations to include everything in S-7 standards. That in itself, wherever the CAR covers a point, would then produce a standard in itself from which the airline cannot change. The mere fact that a recommended practice or a standard exists tends to group all subsequent users about that standard. The tendency, I think, is to adopt the standard. It may not be binding legally or by regulation, but general use gravitates about that standard unless the standard is poor—in which case the standard should be changed. A standard has to be kept up-to-date. A standard is standard only when it is good, and I believe that Committee S-7 probably is in business from now on to maintain and improve the standards they have started. The personnel will change from time to time, but I believe the SAE will keep the panel in operation. I think that in new model aircraft the tendency will be to adopt SAE 7's recommendations and as time goes on the standards will become more and more uniform throughout the industry even though it is not included in the mandatory regulations.

VOLTMETER vs. AMMETER *question was brought up by Charles Froesch, Vice President, Engineering for Eastern Air Lines*

"It has been the thought of the industry that with the existing airplanes we should not make the standards and recommended practices retroactive. Unless a national emergency requires it in some respects, the existing airplanes will remain pretty much as they are at the present time.

"S-7 has quite a few items that have not yet been tackled. We still have the flight engineer's panel to work on. We have not formalized our recommendations on warning lights and signals, and we are working on jet engine controls and the cockpit seat. The suggestion has been made that we work on external lighting of the airplane, but I think this falls a little outside the category of cockpit standardization, and there are several other agencies that are working intensely on that.

"S-7 holds two main committee meetings a year. The sub-committees hold their meetings between the main meetings. We work very closely with the Munitions Board. We have changed some of our recommendations to conform to Munitions Board thinking, and the Munitions Board has reciprocated in changing some of theirs. At the CAB annual review of regulations meeting, the industry, the Muntions Board and ALPA paid Committee S-7 a great compliment by endorsing almost unanimously the entire work S-7 has accomplished thus far."

Charles Froesch: "You mentioned a while ago about this new standardized panel coming in the new airplanes. I think the airline operator will probably change all of his equipment accordingly and of his own volition. I think the one thing we all like is standardization of equipment, so I don't think it'd have to be mandatory.

"I have a question to ask Committee S-7. Machmeters are now coming into being. Is your committee doing anything to combine machmeter and airspeed indicator?"

Dan Beard: "That is one thing that we have to take up. It is to be under consideration at our next meeting. Nothing has been done as yet."

Charles Froesch: "Another question I have is, in a sense, a personal gripe. We have both voltmeter and ammeter. Why should we have a voltmeter? Why not just the ammeter? Our batteries are checked at the end of each run and at the end of each day as to their voltage condition. Why should we have the voltmeter on board? Isn't that a duplication of instruments? As long as you have the ammeter which shows the rate of charge, you know that your voltage ought to be all right."

Dan Beard: "We haven't taken up engine and accessory instruments as yet. That's going to be another project. The pressure was

on the flight instrument panel. My own personal opinion is that the voltmeter is there to check the charging rate of the generators."

Charles Froesch: "But you have your charging rate on the ammeter. You don't find a voltmeter on any other vehicle of transportation which uses electrical power, whether it be a bus, a truck or a train. They have just an ammeter which shows a charge or discharge. There is no voltage control and there is no reason to have it."

Dan Beard: "On a bus, they only have one generator and one engine. On a four-engine airplane you have four generators, and if one generator is pulling substantially a higher voltage than the other, it will take all the charging load. Unless you have those balanced, the voltage regulator is not such a device that it stays permanently in setting. Quite frequently we have to adjust the setting of the voltage regulators on our ships."

Charles Froesch: "But you don't often do it in flight?"

Dan Beard: "It has been done in flight. The flight engineer can do it on the '6."

Charles Froesch: "Extremely seldom. We check our meters regularly."

Dan Beard: "But the maintenance people use those all the time."

Charles Froesch: "Yes, but you can do that with a portable article. You don't need a permanent one in the airplane to clutter up the instrument panel."

Dan Beard: "I would say that at this stage of the game it's an individual choice for the airline."

Charles Froesch: "What I'm trying to do is simplify the cockpit."

Lt. Col. Tom Collins (*Chief Pilot Division, MATS*): "With the advent of the new electrical instruments, the voltage regulator and the voltage instrument is very important because variance in voltage when applied to the inverter will change the actions of the electrical instruments and it is possible to obtain false readings. Therefore, the voltmeter is as important if not more important than the ammeter. In fact, we have gone so far as to add a frequency meter to determine the output of the inverters to assure proper operations of electrical instruments and the autopilots."

O. E. Tibbs (*Chief of Flight Test, Glenn L. Martin Co.*): "One of the big uses of the voltmeter is not an adjustment in flight but the ability to cut out a generator that is malfunctioning, recognizing that it is mal-functioning and turning the load over to a normal operating generator. You can't tell that by amperage output."

Robert W. Blake (*Engr., Pan American Airways*): "That brings up a point that must be considered: how far is standardization to extend. In the matter of the voltmeter, it depends on the kind of operation, the kind of cockpit and what you have on the airplane. Consider the Boeing *Stratocruiser*. You don't have just four generators, you have six. And as a matter of actual practice, we do readjust the generators in flight. Our flight engineers do that. You can't standardize everything. You have to standardize things that are the most important, the things that will get you into trouble if they aren't standardized. Other things you have to leave flexible so that you don't stagnate things. I agree with Charlie—if his operation doesn't need voltmeters, why have them? But don't make us take them off."

Charles Colvin: "*Mr. Prill, what are your thoughts on this?*"

George Prill (*Bureau of Safety Regulations, CAB*): "May I ask Mr. Froesch why he doesn't take the voltmeters off?"

Charles Froesch: "Because they were put there by the manufacturer. They are used as checking instruments at the end of a run."

George Prill: "Well, I'd like to bring out here that there is nothing in the rules which say you have to have them, if you can operate the airplane safely without them."

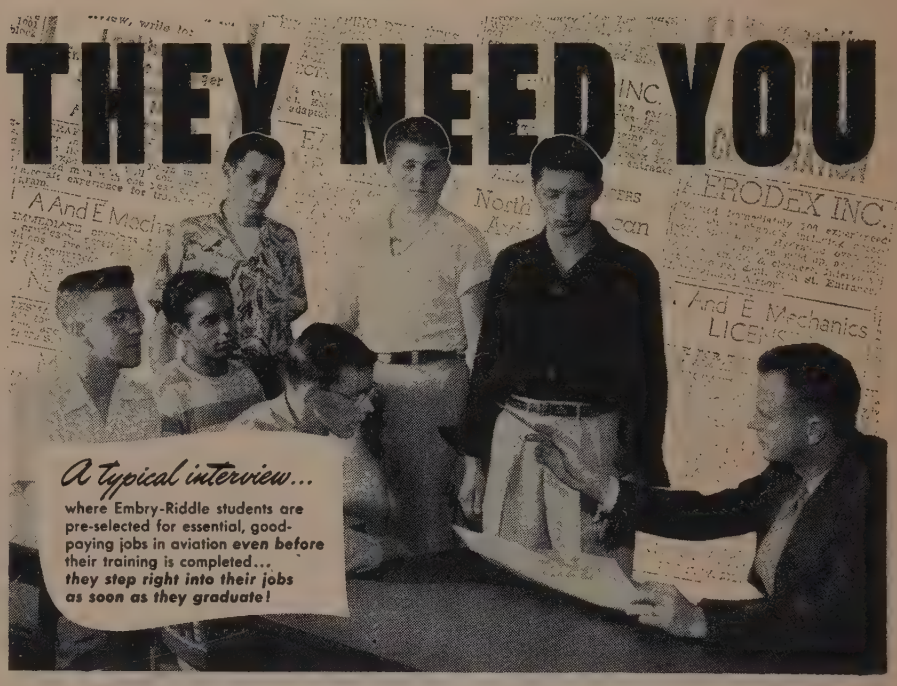
Charles Froesch: "We're running out of space for instruments, particularly on the *Constellation*."

Charles Colvin: "*I take it, Charlie, it isn't so much that you want to take off the voltmeters, it's just that you want the space for something else.*"

Charles Froesch: "That's right. We want the space for something more important."

George Prill: "Mr. Beard mentioned the

(*Continued on page 42*)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TRAIN IN MIAMI - AIR CAPITAL OF THE WORLD

Skyways Round Table

(*Continued from page 41*)

CAB's work several times, and I think it might be desirable here to put on the record just what the CAB did and didn't do and where the Board stands in the picture today.

"Back in December, 1950, the Board adopted an amendment to the airworthiness section of the Civil Air Regulations. This amendment called for a certain amount of cockpit standardization. It specifically mentioned that recent experience in military support activities, performed by civilian pilots in civilian aircraft from the different airlines, had indicated the desirability, from the standpoint of both safety and national defense, of having more standardization of cockpit arrangements. It prescribed the movement and location of certain important controls: powerplant controls, landing gear, flaps, etc. It also prescribed the shapes of the knobs themselves and—probably the most controversial item—it prescribed an instrument panel. The industry felt that these standards could be improved upon and that Committee S-7 was coming up with something better. The industry then requested that the CAB hold back on the rules until S-7 could complete its work. The Board felt at that time that cockpit standardization was something that should be achieved, if possible, by reaching agreement within the industry. If the industry wasn't happy with what the CAB had to offer but would be happy with something else, the CAB was very willing to consider their proposals. As a result, the then effective rules were rescinded until April 1, 1952 and they came back into force this year.

"Last week at the CAB Annual Airworthiness meeting, the Aircraft Industries Association and the Air Transport Association presented the S-7 cockpit arrangement and requested that it be considered as a replacement for the present rules. The Board itself has not considered that proposal as yet, but the proposal has been given to the Bureau of Safety Regulation who will make recommendations to the Board. I think it is safe to predict that the Bureau and the Board will look with favor on the recommendations of S-7.

"The Board has done everything it could to sponsor S-7's work. There may be questions as to minor details, but I'm sure they can be worked out. What the Bureau of Safety Regulations is proposing to do is to take the recommendations of the AIA and ATA, including both the cockpit standardization items and the almost finalized agreement on the instrument panel arrangements, and send them out as a Notice of Proposed Rule Making. That is the legal phrase the Board uses to describe a draft-proposal which is sent out to the manufacturers, the Air Line Pilot's Association, the airlines and other interested parties for comments. These comments will be analyzed by the Bureau and by the Board who will then take final action.

INTEGRATION *is big problem in standardization, simplification, says Lt. Cmdr. Hoover*

"All of the rules proposed in the document to date are applicable only to future types of aircraft as distinct from aircraft still coming off production lines and as distinct, of course, from aircraft presently being operated by the carriers.

"Mr. Beard and Mr. Froesch both have mentioned retroactivity. The Board has proposed such a thing and in the Boards draft releases and press releases on this subject the problem of military support activities has been mentioned. The problems of coordinating with the Department of Defense in the possible crisis which may face us have been mentioned. We are working closely with the Defense Air Transport Administration which is concerned with standardizing aircraft. The Defense Air Transport Administration already has set up arrangements with a number of airlines for furnishing aircraft to the military, complete with crews, in case of rapid mobilization. These aircraft will be furnished to the military fitted with certain gear: radio racks, wiring, etc., so that they will be ready on short notice to go into a "lift" as needed.

"The cockpit standardization question enters here, and the Board is faced with the question of just how much good cockpit standardization will do. I think all of us here agree that it is desirable that the aircraft the military take over in the event of a mobilization be standardized. We sincerely hope that the airlines themselves will make a proposal on this thing and will consider the subject carefully. I think Mr. Froesch's statement that the airlines quite possibly would standardize their own equipment voluntarily, is a very important one. I hope the airlines and the other interested parties will make their views known to the Board on this subject.

"As I've said, the Board has been considering standardization for several years. We certainly don't want to do anything that would hurt the industry. On the other hand, we must do everything we can to cooperate with the Department of Defense. If anyone has any views on this subject, we will be pleased to hear them."

Robert V. Garrett (*Chief Pilot, CAB*): "I'd like to add to Mr. Prill's statement about the necessity for standardization. It wasn't only in the interest of National Defense, it also was on the interchange of equipment between certain air carriers."

Charles Colvin: "*Right now I'd like to ask Cmdr. Hoover to give us some of his ideas. He seems to have the radical idea that one of the difficulties in achieving standardization has been that some of the things we've been trying to standardize aren't good enough yet to be standardized.*"

Lt. Cmdr. George Hoover* (*Office of Naval Research, Air Branch*): "I think the trouble we've had in trying to standardize is an indication that there must be something wrong with the equipment itself. If it were good enough, there wouldn't be any question on how to arrange it. Instrument panels have just grown like Topsy. As engines develop more power and we go to higher altitudes, we're required to have more and more pieces of information. But very seldom do we ever get to the point where we have time to combine any of the indications. Here's a good example of that which we realized early in the game when we were building Link trainers. We were spending thousands of dollars developing Link trainers to teach instrument flying, which was a very difficult training problem. Suddenly, it dawned on us that we were working on the wrong side of the fence. The instructor, sitting on the outside watching his recorder go around, was having no trouble determining what was going on, but the pilot was knocking himself out on the inside. We decided that perhaps our whole approach was wrong, so we analyzed the thing this way: the airplane is only as good as the pilot, and the pilot is only as good as the information he is getting. If he is going to fly on instruments, he must have complete information and it must be direct. In other words, we have to get away from the idea of forcing the pilot to be the computer—there are just too many elements to integrate. A standard jet today has between 25 and 30 gauges that the pilot must observe, and at 400 or 500 mph this is almost impossible to do under duress without hazarding a mistake.

"I think that the big problem we are faced with is integration. For instance, the ILS came out, the Zero Reader was developed; the new Collins Approach System made its appearance. Each of these give individual pieces of information. But nowhere do we actually combine this information with the basic information of attitude. This means that when we fly normally, we're flying attitude; then suddenly, at the critical,

**The opinions or assertions contained herein are the private ones of the speaker and are not to be construed as official or reflecting the views of the Navy Department or the Naval establishment at large.*

point of the flight, we make an approach and are forced to switch our eyes from a basic instrument to a cross-pointer type and then follow that system. The indications are not the same and, as a result, there is a mental shifting of gears.

"First of all, what is a pilot looking for? Obviously, he's looking for something which will indicate what the airplane is doing. Very few people have trouble flying contact because the information they are getting is natural, and it is just a matter of training a man to coordinate his movement of the controls. From that point on it becomes a matter of developing skill. Then we get to the point where we fly instruments. Suddenly, we put the man inside, we give him a series of what could be called hieroglyphics, and tell him, 'Now visualize what you are used to seeing.' Our argument is, why visualize? Why not reproduce the same thing that he is used to seeing?

"We should attempt to build a system as closely as we can to actual contact flight. I feel that once we can combine information and put it into the proper form on the panel so that there need be no transition from contact flight to instrument flight, then we can definitely standardize, because it will be obvious and everyone will go along with it.

"I don't think we are actually analyzing the instrument problem in the proper manner. When a problem arises, we attempt to solve it with whatever equipment we have on hand or that which can be developed in the very near future. In addition to this, we should wipe the control panel clean and start from scratch. This would be a long-range approach, but we should try to get ahead of this spiral of instrument requirements.

"You of the civil airlines have other problems; you have a production problem of an immediate nature. You have to supply your airplanes with whatever is available. We are in a position to look ahead, which we must do mostly because our problems are somewhat different from yours—we are already flying at 500 or 600 mph, and we will probably fly faster. If we do, we realize that the individual is going to have to think about four times as fast as he does today. He can't do it efficiently by being forced to integrate 30 pieces of information.

"Another thing that is wrong with the approach to the cockpit problem is the tendency to isolate parts of it. When you talk about aviation, you talk instruments, controls, fuel, in fact the entire aircraft. So when you attempt to build a new cockpit or simplify or standardize it, the entire mechanism must be considered. We have our troubles along that line. There are those who feel the fire-control system is the most important; others figure that flight instruments are the most important, and so on down the line. Whoever gives the best argument usually gets the front spot.

"The basic problem is that we haven't enough space. We haven't enough space because two things can't occupy the same space. We must integrate these things in order to utilize this small space. As long as we use mechanical gauges the way we are doing now, we are forced to make the gauges smaller, and in making them smaller, we are reducing the adequacy of the information that is going to the pilot. The whole goal is to make it possible for the man to step from basic training into an airplane without any transition whatsoever. As far as the pilot is concerned, it doesn't make any difference whether it's raining, snowing or the sun shining. He's happy if he's getting the data he needs, and standardization will be an automatic result.

"I would like to make it clear that I am 100% for standardization, but I feel that we should standardize with a good look at a new approach to over-all data presentation."

Charles Colvin: *"Mr. Tibbs, do you have some ideas?"*

O. E. Tibbs: "I agree with Cmdr. Hoover wholeheartedly in that the information being given to the pilot at the present time is inadequate. It is too complicated to be of benefit. I'm looking for the time when I can see at least one instrument removed from the cockpit, rather than added on every new model airplane that's built. When I get into an airplane, I'm always amazed that they've found room for additional instruments. We just keep adding and adding. We never succeed in developing an instrument that really substitutes, does the job and satisfies the pilot as to its reliability. For example, we still carry the bank-and-turn, and yet we have about three instruments that will substitute for the bank-and-turn indicator but still no one has worked up sufficient courage to pull the bank-and-turn out of the airplane. We must get around to that.

"The manufacturer would certainly welcome standardization and simplification. From the standpoint of cost alone, if for no other reason, it behooves us all to work toward that goal. When a manufacturer makes an airplane of the same type for more than one customer, the cost goes up tremendously because of the difference in cockpit arrangement. If we could standardize, there would be a certain amount of money saved on every airplane, plus the additional benefit of increased safety."

Charles Colvin: *"Col. Collins, what is MATS point of view? Do you go along with what Charlie Froesch and Dan Beard had to say?"*

Lt. Col. Collins: "Yes. As you know, MATS is the Department of Defense's Air Route Command and as such we have two components, Navy and Air Force, each having its own logistical support and its own type of equipment. Basically, they are the same. When we first started, we were standardized among squadrons, but not within MATS. A Navy squadron flew the airplane in one man-

(*Continued on page 44*)

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SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Skyways Round Table

(*Continued from page 43*)

ner, and an Air Force squadron flew it in another manner. We could not interchange the airplanes nor the crew. For the past year and a half, however, we have been able to fly a Navy pilot and an Air Force pilot side-by-side in the DC-4 fleet and we plan to do the same thing in the near future in our DC-6 fleet.

"I use this example because it typifies the problem existing in the present interchange agreements and will be prevalent in the CRAF (Civil Reserve Air Fleet) plan. Like MATS, the airline industry is confronted with the problem of mandatory standardization.

"There will always be a shortage of airlift and to provide maximum utilization of available airlift, it will be necessary to move aircraft to the area of greatest need, *e.g.*, Berlin Airlift and Pacific Airlift.

"Because of this increasing trend of interchange of crews and aircraft, the need for standardization is readily apparent. However, unless the guidance and instruction emanate from a representative group of the airline industry, standardization will become a reality only between a few airlines and not throughout the industry.

"I'd like to add my thoughts to several points that have been discussed. As airplanes have grown, the number of instruments, controls, levers and knobs also have increased, mainly to bring information to the pilot, the engineer or the person so concerned. The number of instruments, etc., has increased to a point where it exceeds the visual scope of the pilot. There are one or two ways to overcome this: either combine the instruments or remove the instruments to another position for another person to watch. If we combine instruments, it takes twice as long to read that instrument as our eyes move across the panel. The one answer, perhaps, is to move the instruments to another position where a person not directly concerned with flying the airplane could monitor them.

"This problem is one that will have to be resolved by the various Boards. The SAE-7 Board is doing a fine job along that line, and I think we will all benefit from its result."

Charles Colvin: *"Col. Lee, do you have an idea you want to toss in?"*

Col. James L. Lee (*Chief, Flight Branch, Directorate of Operations, USAF*): "We in the military, of course, have one problem the airlines do not have. This is the cockpit problem confronting the combat-ready pilot of the single-engine jet. If we can solve this problem, the others will fall in line. I've been a member of the Munitions Board Cockpit Standardization Panel for about a year. Col. Boudwin, however, has been on the Board since its conception and, for the record, I'd like him to tell you a bit about what it has accomplished.

"Before he takes over, though, I'd like to add that we hope to have the Board's recommendations, which we have almost finalized, put out as a Department of Defense Directive on cockpit standardization. It is important to note that thus far Committee S-7 is in agreement with our work, and vice versa."

Col. Boudwin: "Following along with what Col. Lee has said, the Cockpit Layout Panel of the Munitions Board was organized in August, 1948. At that time, the Services realized they had two problems; one, that they were operating many different types of aircraft and many different types of pilots were flying those aircraft; two, a ground handling problem existed in that ground crewmen often had to work on airplanes they'd never seen before. Faced with those two problems, the Services realized the need for standardization of aircraft cockpits.

"The cockpit layout committee first worked on a cockpit panel for a single-place military-type aircraft. About a year later, the committee initiated the study of side-by-side cargo and transport-type cockpits. It was then decided to obtain data on airline experience. We invited Mr. Beard and some of his coworkers from S-7 Committee to attend a number of our meetings. It was about that time that the Government, as Mr. Prill brought out, announced it was completing a plan to mobilize commercial aircraft and pilots for military use in case of a national emergency. With that announcement, we realized that if we were going to take over commercial aircraft and pilots, it was important to standardize as closely as possible, the military with the commercial and vice versa.

"To date we have held 25 meetings, and now have a paper ready to present to the Munitions Board. We hope to have it published as a National Defense paper which will take in all the service activities. We have worked and coordinated with the S-7 Committee on the portions of the paper which apply to commercial aircraft and we have resolved practically all our differences.

"It is hoped that when the Services purchase what we call off-the-shelf aircraft for the military use, it will not be necessary to spend large sums of money modifying the front ends of the airplanes. By the same token, after an emergency and military aircraft are turned back to commercial companies, there will be no need for them to spend additional amounts of money modifying the front ends of the airplanes."

Col. Lee: "One thing I'd like to add as background to the findings of the Munitions Board is the fact that the Aero-Medical research people, both Navy and Air Force, have been conducting continuous studies on human behavior in the cockpit, and that all items recommended for standardization have either been developed or approved by the Aero-Medical. For instance, someone mentioned that when several experienced pilots discuss standardization and simplification, there are almost as many different ideas as there are pilots. Our Aero-Medical people, in their studies of cockpit standardization, have used both men and women who were never in an airplane as well as experienced pilots in their experiments. The results of these studies have revealed that the experienced pilot's beliefs are not always based on the most efficient approach."

Charles Colvin: *"Mr. Kelly, what are your views?"*

J. B. Kelly (*Ass't. to Ass't Chief Engr., Pan American World Airways*): "In the matter of the military taking over airplanes belonging to the commercial airlines, the example was

MUNITIONS BOARD *members, Col. James L. Lee (left) and Col. Joseph E. Boudwin, brought Round Table participants up-to-date on the accomplishments of the Munitions Board Panel*

very plain on how much money was lost on the deal in 1950 when DC-4's, manufactured for the military and which probably had standard cockpits while on military service, were purchased by the airlines after the war. In 1950, Eastern, American, Pan American, Capital, Panagra, Western and others threw those same airplanes back into the fleet and not one was the same as far as cockpit layouts were concerned. A Pan American crew would fly an American DC-4 from San Francisco to Honolulu. An American crew would fly their own plane to Wake Island. Then a Capital crew would fly this American plane to Tokyo. For a while it was confusing to dispatchers as well as to flight crews, but with a build-up of experience and a great will on the part of all flight crews concerned to make the system work, the operation became as smooth-working as any domestic scheduled airline operation.

"The commercial airlines had spent money to change the planes to their standards; they had been standard when they were owned by the military. To get back into fleet service, those airplanes had to be made standard again. In short, the airlines had to pay twice to get the planes back to a standard everybody could use.

"But there is no one system that should be preferred above all others. For example, American Airlines has one type of instrument panel (standard for that company), and the line has built up a remarkable safety record with it. UAL has a different type of instrument panel and that line has a great safety record. Pan American has a panel differing in some respects from all other airlines, yet we get along quite well. The problem is similar to that of millions of auto drivers looking in different places for the same information—everyone just makes himself proficient with the system he happens to be using."

Col. Boudwin: "That's the reason why we have to have a standard that is the same for military as well as commercial."

B. H. Horchler (*Assistant Publisher, SKYWAYS*): "Is it the feeling that the SAE committee is helping to bring this about?"

Col. Lee: "Yes, indeed. We're very pleased about the Committee's cooperation. It would be useless for the military to standardize on a transport-type aircraft if the civilian industry did not also standardize on the same type aircraft."

Robert Blake: "I'd like to know to what extent the military, particularly MATS, is planning to retrofit current aircraft to meet the new standard. It's assumed that new aircraft will come out meeting the standard, but to what extent are they actually going to retrofit all the aircraft they now have?"

Col. Lee: "From Air Force Headquarters' point of view, we have not stated there would be any retrofit required. This is because of the extreme expense involved. When this recommendation or order is put out, it will only affect new production aircraft. Navy members of our panel made the same stipulation."

Charles Colvin: "*Does that answer for you of The Military Air Transport Service?*

Lt. Col. Collins: "Yes, to a degree, but we are in some instance standardizing with civilian operators on items of common use, such as radio and certain flight instruments. MATS will be charged with the operational control of a civil fleet in time of an emergency, and it's only logical that standard items be available in both military and civilian supply channels. However, we still have to stay within the economic means of the Air Force and Navy Procurement. It's a very fine line to determine those items one would standardize."

Robert Garrett: "Col. Lee, how far does this go now? Wouldn't the aircraft coming off the production lines be affected by this standardization? Your DC-6's, for example, and the *Constellations*."

Col. Lee: "As far as the Air Force is concerned, as of now, new aircraft are standardized to the degree reached by Air Force specification. These specifications are up-to-date with the findings of the Munitions Board's Cockpit Panel. At such time as the Cockpit Standardization Panel's findings are published as a Department of Defense Directive, military standardization will have been accomplished."

(*Continued on page 46*)

Facts and Figures!..

Figure:

Owned by Winona Cox, Dallas payroll clerk. Brown hair, hazel eyes. 5'9", 135 lbs., 24, single. That rake (like a SAC customer) never had it so good. Winona was our November girl last year, ringing bells with admiring letter-writers all over the world, including GIs in Korea, Japan, and Germany.

Fact:

ADMA — Aviation Distributors & Manufacturers Assn.

Southwest Airmotive supports, and believes in, the program of the Aviation Distributors & Manufacturers Association. In promoting greater integrity and cooperation among the manufacturers and distributors of aircraft parts and accessories, ADMA is performing an invaluable service for the entire industry. We salute this trail-blazing group and wish it well at its Annual Convention, Dec. 3-5, at The Kenilworth, Miami Beach, Fla.

Southwest Airmotive Company — Love Field — Dallas

Skyways Round Table

(Continued from page 45)

Lt. Col. Collins: "I think it's uneconomical to demand a retrofit. The place to start, economy-wise, is on current production aircraft. We attended a meeting the other day on the Track System. This plan allows the civil fleet to retain its individual desirabilities, yet the aircraft will provide certain military variations so that seats or litters can be installed in any desired density. The aircraft would remain readily convertible to any use desired. The tracks would become part of the structure as opposed to a retrofit by placing the track, as extra equipment, over the existing structure. This is the type of planning now evolving from the interest in standardization. It's a little digression from cockpit standardization, but it is an idea, and the theory should be adopted throughout the aircraft industry."

George Prill: "I think one of the most difficult matters in this standardization problem is where to draw the line between 'too early' and 'too late.' Every new device that has come along, from the old needle, ball and airspeed days on up, is first experimental and at that point it's considered too early to standardize. We keep installing it in airplanes, but it's still on an 'operational trial' basis and not standard. Then all of a sudden, one day we find everyone is using it. But by that time it's too late to standardize. Cmdr. Hoover mentioned the problem of new things coming along. We have VOR's in operation, and RMI's and cross-pointers are included in the S-7 recommendations, but we have DME coming along and there are various ways of presenting DME information and, of course, we have pictorial computers, some for panel installation and some to be held in the pilot's lap, probably because there isn't enough room in the cockpit filled with the standardized instruments. But whenever you start talking about standardizing any of these items, somebody will say, 'Oh no, it's much too early to standardize this because it's still experimental.' How are we going to decide when we can say, 'It's no longer too early and it isn't too late . . . . as of now we standardize'?"

Col. Lee: "We've made great strides in the direction of accomplishing just that this past year by a free exchange of ideas. We're no longer working at separate purposes. Whenever something now comes up, we . . . and by 'we' I mean the military, civilian and the CAA . . . all know about it. I believe we're reaching that point where we will be able to standardize at the earliest possible moment after the new items have been tested."

Charles Colvin: "*Mr. Penfold, how do you get new equipment standardized and into an airplane? As a representative of Collins and with the Collins Flight System available, what is your point of view?*"

H. F. Penfold (*Asst. to Executive Vice Pres., Collins Radio*): "After listening to the remarks that have been made here today, I can see that our education has been a bit amiss. Apparently, we aren't getting sufficient information into the general aviation circles.

"Collins is primarily an electronics manufacturer, although we have investigated a great many navigation systems. We have adopted one in which we believe wholeheartedly as a means of providing direct information for the pilot."

"I'm not qualified to discuss standardization from the military or the commercial point of view, but it's on the subject of simplification that I believe our education has fallen short. The one thing we are trying to do with our integrated flight system is to reduce the number of instruments."

"The reduction of instruments is probably one of the major items of importance, and with the integrated flight system we present a lot of information but not in a complicated fashion. With the integrated flight system we actually replace five instruments with two.

"Another item of major importance is that we provide a pictorial presentation of information. We don't necessarily think of flying in terms of discrete distances or absolute information that is presented on a dial. We depend on something to tell us what to do and we follow instructions. We are actually supplanting information with pure guidance.

"Another major feature of the Collins integrated flight system is non-ambiguity. A great many electronic aids are very accurate and very precise in their presentation, but they are also very confusing. Non-ambiguity is probably one of the features that will have to be observed in any new piece of equipment.

"The fourth major item is a coupling of information. To my knowledge, this hasn't been done before. We couple actual position information with attitude information. Cmdr. Hoover mentioned attitude information as being one of the sadly lacking items. We have overcome this discrepancy by not only providing steering information and normal navigation information in terms of radio aids such as VOR and ILS but by also providing actual attitude information on the instrument panel to determine what the airplane is doing while following an ILS approach.

"The concentrated space effort is probably one of the things that has been a great problem in combining navigation and attitude information. We have done that in two instruments. One is called an Approach Horizon. It consists of the normal type of D'Arsonval meter movements to provide all the information in that one instrument. The other instrument, a course indicator, is a little more complex. It includes a servo amplifier, RMI repeater ring, and other self-synchronous devices to provide steering information and deviation indication from a chosen course, either magnetic or from radio information from the ILS.

"Many of you here have stressed the fact that training the pilot is one of the biggest handicaps. It is our belief at Collins that the method of training the pilot should not be in conflict with any system now in use. Training has to be a smooth and integrated system, one that will not involve a complete turn-over from one type of instrumentation to another. In addition, it cannot divorce all the systems that are presently in service on the ground.

"Cockpit instrument systems used heretofore have been mainly in the form of indications, such as meter movements. While we have discussed the possibility of changing this type of display, we must remember that we are also dependent upon those displays which have been proven over a period of years. The existing facilities also must be considered because if we intend to put a system into use within a short period of time, we must use things already in practice. That doesn't mean we are impeding progress by divorcing the possibility of a new system, but it does mean that we must

PAN AMERICAN AIRWAYS' *view of cockpit standardization, simplification was expressed by Robert W. Blake (center) and John B. Kelly, Jr. (right), both of Pan American World Airways*

use methods in airplanes which are now in flight status, and not eliminate them even though they may soon become outmoded in their present form.

"Getting down to the approach problem, ILS *vs* GCA is not an argument that I can enter. First of all, I think they are two separate and distinct systems and yet they must be combined. The ILS is completely pilot observed, visually and in some cases orally, but in GCA, the pilot has only a visual check of his standard flight instruments in addition to receiving ground guidance. The airline operations are based primarily on the ILS system, whereas the military is primarily GCA.

"I again wish to call attention to the two problems that have been under discussion: one is the problem of training and the other is the problem of simplification. I think we've answered both of those with the Collins integrated flight system."

Robert Blake: "I'd like to point out here that the activities of the S-7 committee show a concrete example of how new devices can be incorporated in a new standard. The panels that the committee did standardize on included two devices which at the time had only very limited use. Both the new Sperry Zero Reader and the new Collins Approach Horizon were permitted by the standard panels. The approach you have to take in standardization is to write your standards so that the latest devices will be permitted. At the time this standard was set up, I don't believe anyone had other than experimental operation of the Approach Horizon, and there was, I believe, just one airline that had underway a fleet installation of the Zero Reader. That's pretty early in the operational life of a new device to be included in the standard and I think it shows what can be done."

Charles Colvin: "*Mr. Stoner, you're intimately concerned with this, as a member of the SAE.*"

M. LeRoy Stoner: "The problem of developing latitude in the standard to allow for advancements or changes has been one that we in the standards business have been concerned with for a long time. The only answer apparently lies in the genius or ingenuity of the people who develop standards. They have to develop a standard that possesses latitude, as for example the latitude built in to the instrument panel as devised by S-7. The S-7 committee even developed a proposal with alternates. Sometimes, however, that isn't too good because having an alternate gives defeat to the standard itself.

"Another way we of the SAE have tried to cope with advancements is to develop standards only for voluntary use. That's been true of SAE standardization work from the beginning. The standards adopted are only for voluntary use, and as soon as we discover that the standards we have on the books aren't used voluntarily, those standards are crossed off and we try to develop something that will be used.

"As a general statement to add to this discussion, I was interested in reading the recent report that was published by Jimmy Doolittle's group, the President's Air Policy Committee. In that report, one of the items given great stress was the fact that our currently operating aircraft do not have any great degree of standardization. The report goes into detail emphasizing need for it."

Charles Colvin: "*Mr. Pecoraro, what are you people at the Special Devices Center doing?*"

J. N. Pecoraro (*Special Devices Center, Office Naval Research*): "What we're trying to do is, in a way, compatible with what the SAE-7 committee is doing for the airlines. We take some of the ideas expressed by Admiral de Florez and Cmdr. Hoover and try to make them feasible, only we do it another way. We are not actually building equipment for aircraft installation. We're only interested in displays of the simplified types of instruments. We have evaluated, for instances, the types of integrated displays mentioned by Mr. Penfold of Collins and Col. Lee of the Air Force.

"We have outlined the instrumentation needs in jet aircraft, and we have come up with what we call a composite flight indicator. We have come up with the in-line indicators that the Admiral spoke of.

"We have studied the problem of controls and we have studied the general arrangement and location of controls. But we are doing all this on the ground. We are simulating flight and the flight indications that show up on the dials in the cockpit. We call it an aircraft 'flight simulator.' Using this flight simulator, we have pilots, many times training pilots and even people who have never been in an aircraft cockpit, go through the system and evaluate new instrument displays.

"When a pilot says a certain instrument is the type he prefers over all others, we say, 'Okay, but if you don't mind, we'd like you to fly both instruments.' Then we have him fly both via the flight simulator and then show him his performance. If the score is the same, we say, 'Well, look . . . you flew just as well with our display as you did with the current display.'

"We realize that the work we do could play a major part in standardization, and that's why we are interested in the standardization problem."

Charles Froesch: "As I see it, gentlemen, we are faced with two problems in the standardization of cockpits. Number 1 is the practical problem which requires standardization to permit universal use of transport airplanes and also for National Defense. Number 2 is to get a standardization that is flexible enough to encourage possible developments and embody all needed improvements."

M. LeRoy Stoner: "We of the SAE committee feel that the problem is just beginning and it's one that isn't going to be resolved quickly. Every increase in aircraft performance adds a new control or a new device that has to be watched. Therefore, simplification is going to be a tougher problem in the future rather than a simpler one—but it must and will find solution."

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De Havilland Dove

(*Continued from page 13*)

west of Denver and in the Northwest.

With wheels and flaps down, the *Dove* has a high rate of descent. I used 20° of flap and made my approaches at about 90 mph. For normal approaches at full load of 8,500 lbs., the *Dove* manual recommends these speeds: Full flap, 85 to 90 mph; 20° of flap, 90 to 95 mph; no flap, 100 mph.

The *Dove* has excellent handling characteristics on final approach, and is very easy to land. In 23 years of flying I believe the author holds the undisputed U. S. bouncing record of an aircraft on landing. However, due to the *Dove's* tricycle landing gear and rubberized oleo struts, I was unable to negotiate even one decent bounce. My passengers were impressed with the *Dove* because they commented on the smooth cushioned landings afforded by this airplane.

I liked, too, the ground handling qualities of the *Dove*. Both wing tips are visible during taxiing, because of the high position of the cockpit, the bubble-type canopy and good windows on both sides.

No airplane is perfect and I am always highly critical of anything in the cockpit which makes the pilot's task more difficult. To start the engines, I found I had to be something of a contortionist. To accomplish that task alone, the pilot must reach down back of his seat with his right hand and lean way over to the right side of the cockpit with his left. Starter buttons should be more accessible.

I am sure, too, that American pilots, all of whom are high-performance conscious, would like to see more power for take-off and cruise. When I mentioned that to Dorrington, he told me that the Mark II *Dove* will carry modified versions of the *Gypsy Queen* engine to provide improved all-round performance and, if it is desired, higher payload.

The vertical portion of the control columns are set against the cabin side walls instead of between the legs. This gave me the sort of leg room I like. The brake control and parking brake knob are on the control column and, being accustomed to toe brakes, it took concentration at first to remember that. The rudder bar can be quickly adjusted by raising each pedal with the toe and dropping it into a slot. Pedals are of the pendulum type and seats are adjustable.

Mounted on the pedestal and easily accessible to either pilot are throttles, prop pitch controls, gear and flap levers, elevator and rudder trim tab controls, cooling flap controls. The propeller control has an internal cam arrangement and an additional stop prevents unintentional reversing of the propeller. On the engine instrument panel are engine-speed indicators, boost, oil temperature and pressure, cylinder temperature and fuel gauges. All instruments have yellow fluorescent markings and can be seen when an emergency puts out lights. Normal red lighting is provided.

I almost jumped out of my seat the first time I retracted the gear. It really comes up fast and snaps into the well with a bang that can be felt and heard throughout the aircraft. There is no hydraulic system in the *Dove*—a pneumatic system being used for the gear, brakes and flaps.

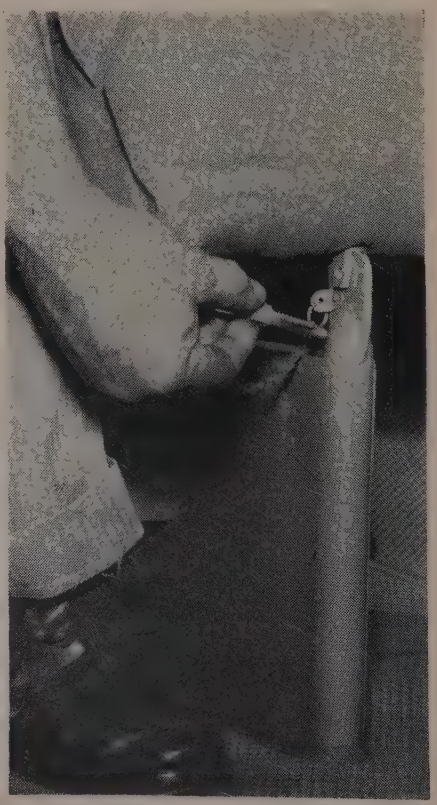
The brakes are, of course, operated by that intriguing little thumb lever mounted on the first pilot's control column.

One reassuring feature of the *Dove* is that, in the event of the failure of both air compressors (one for each engine), the pressure in the storage bottles is sufficient to lower wheels and flaps. And, since de Havilland seems to have thought of everything in this airplane, you are not completely lost if you happen to lose both compressors and the pressure from storage bottles. There is an emergency air bottle, which feeds pressure through separate lines direct to the pneumatic rams in the gear. The control valve for this emergency system is under the first pilot's seat.

There is a simple fuel system in the *Dove*. There are two interconnected tanks in each wing, holding 101 gallons—or a total of 202 gallons. There is a cross-fed system for supplying fuel to opposite engines when necessary. An extra tank, providing a total capacity of 267 gallons, is available. In fact, the *Doves* being ferried to the U. S. are all equipped with the auxiliary tank.

No story on the *Dove* would be complete without a run-down on its de-icing equipment. It has full wing, fin and tail de-icing and the fluid is distributed by special porous elements built into leading edges. There are three systems of de-icing control: one is manual, a switching arrangement; another is automatic, with a switch being turned on and left on during flight, and a tiny perforated tube in the nose swings the pump into action as soon as icing begins; and the third is a switch for emergency use. It provides five times the normal rate of flow to cope with extremely heavy icing conditions.

SEATS *in Dove are removed easily. There are just four cotter pins, one at each seat leg*



Because the *Dove* was designed for feeder-line operation, the executive version benefits. The passenger cabin is surprisingly free of noise and vibration, and ventilation is excellent. Glass wool is used for soundproofing. There is little vibration from the two *Gypsy Queens* and de Havilland representatives attribute that accomplishment to the pendulum crankshaft shock absorber incorporated in engine design.

The *Gypsy Queen* 70 used in the *Dove* is, of course, a de Havilland design. It is a six-cylinder in-line, inverted, air-cooled, continuous-injection, geared and supercharged powerplant of 340 bhp for take-off. It is designed to take the DH constant-speed, feathering and braking propeller, which is built under Hamilton Standard license but modified for each de Havilland application.

The prop on the *Dove* is a three-bladed, constant-speed, feathering and braking propeller which rotates counter-clockwise. The pitch-change mechanism is contained in the dome and the constant-speed unit is in front of the engine and right in a spot where it can be serviced easily and quickly. The *Gypsy Queen* 70 is the only six-in-line engine with a geared propeller, so far as I know.

The seating flexibility of the *Dove* is a feature attractive to corporate and executive operators. It ranges from six to 11 seats. The one I flew had six seats and that appears to be the most comfortable, especially for long trips. However, for short trips the *Dove* seating can be eight, nine or 11. There is a removable bulkhead just in front of the loading door and another at a point in front of the rear luggage compartment. The removal of four cotter pins permits seats to be lifted out.

Although the *Dove* was designed with tank capacity for 1,000-mile flights, the plane is much more suitable for shorter runs. It is ideal for hops of 200 to 300 miles, carrying tanks half full and eight to 11 passengers at a cruising speed of 170 mph. It is economical also in the 400-600 mile range, with a payload of 1,460 lbs.—six passengers and luggage.

Cost of the versatile *Dove* runs around $89,000—complete with gyro instruments, etc. The "extras," available at extra cost, of course, are radio and de-icing equipment.

I like the *Dove* because it handles like a scheduled airline transport and because it has been designed to the relatively high standards of maintenance, equipment and performance found only in equipment used on passenger routes. I am looking forward to comparing it with the Twin-Beech and, as the British would say, "Let's have a go at it, Yank."

Air Fleet for Business

(*Continued from page 20*)

to do the job. Lee and I joined Continental as soon as we were through with our wartime duties for Consolidated.

Our first airplane was the stagger-wing Beech. This we bought to use while awaiting delivery of our first Twin-Beech. On December 6, 1945, we took delivery of the Twin-Beech, the second one to come off the Wichita assembly lines after civilian production was resumed. Our second new Twin-Beech was purchased in March of 1946 and shortly afterward an order was placed for a third, to be delivered in 1947. In the autumn of 1947 our top-level management began to kick around the idea of buying a four-engined B-24 *Liberator* for sleeper hops primarily between our New York and San Francisco offices, and also for other long hauls. After a year of mulling it over, we purchased this airplane in the autumn of 1948. In 1950 we rounded out our present fleet by buying a Lockheed *Lodestar* which we converted ourselves and put into operation in April, 1951.

At the present writing we have flown about 10,400,000 passenger miles without so much as scratching anyone's fingertip. We have built a new $300,000 hangar at the Morristown, N. J. airport and staffed it with 28 people on a full-time career basis: four captains, five copilots, a flight engineer, a hangar foreman, lead engine, sheet-metal and radio mechanics with full staffs, two secretaries and two chauffeurs for the two Lincoln "Cosmopolitans" which shuttle passengers to Morristown and other airports in the New York area from our 42nd Street main office in Manhattan.

We base the B-24, *Lodestar* and one Beech at Morristown. We have sold the staggerwing single-engine Beech and one of the twins. One Beech is kept in Chicago for easy utilization by our central division people.

All maintenance is handled in our fully-equipped maintenance shop in Morristown. In addition to servicing our own planes, we supply hangar space, tie-down facilities, office space and maintenance to General Electric, Triangle Conduit and Cable Company, and the Celanese Corporation. We are authorized Shell distributors of 91 and 100 octane gasoline and lube products. We are definitely in the aviation business. As a matter of fact, at the moment we are watching with interest the new T-36 twin-engined Beech which USAF is buying in quantity for transport work. The T-36 looks somewhat like a small Convairliner, features backward-facing seats, pressurization for high-altitude cruising "over the weather", a 300-plus speed which might be further boosted through use of compound engines, and carries 10 passengers. When we finally retire our present fleet, it may be that we'll consider the T-36 as a fleet replacement if something better doesn't come along in the mean time.

Now then, for the benefit of other corporations or individuals who may be toying with the idea of flying a fleet, let me get down to nuts and bolts. We've learned a lot in 10,400,000 miles which might be of practical value to outfits starting out.

First, our location. We were the last to leave when Roosevelt Field closed. For months we had been vainly combing the New York area for hangar facilities. Renting was out of the question. There was nothing to rent. Building costs were high, but that wasn't the thing which bothered us most. What bothered us was the stipulations that everybody seemed to want to force on us if we built our own hangar. A short lease, rapid amortization, high subsequent rental, no real voice in field operations—these were the things which held us up. We faced a very tough and risky future if we invested $300,000 in a hangar under such fine-print rulings.

Alan B. Heinsohn, the present airport manager at Morristown, finally presented us with the best deal we could find and we moved our operation over in October of 1951. We are very pleased with everything. We are glad we came and intend to stay permanently.

First, let me take up the problem of office-to-airport transportation in the New York area, plus its attendant headache, and getting the plane airborne without annoying delays. Since almost all our flights go west or southwest, Morristown had one thing to recommend it in that our people were moving *toward* their ultimate destination, not *away* from it, when they boarded at Morristown instead of Roosevelt. On every trip we thus saved the airtime between Roosevelt and Morristown—not much, but it adds up over the years. An even more important advantage was our freedom of movement. We can take off at any time during the day or night from Morristown without trailing half a dozen airliners down the ramp and holding for many minutes while stack-ups are landed ahead of us.

It should be mentioned here, however, that at the moment most of our incoming flights terminate at Newark, Westchester or La Guardia to suit the convenience of passengers living in these areas. This is not our permanent plan, however. New and better highways are bringing Morristown many minutes closer to Manhattan as the months go by. Eventually, we expect to terminate a major number of flights at Morristown and so avoid all of the hazards and annoyances of flying through smog and heavy traffic to the big main terminals.

Continental Can happens to be a natural for corporation aviation. We operate almost a hundred plants, research labs, maintenance shops, mills and sales offices in all sections of the North American continent. Decentralization is our watchword. We have purposely built our facilities as close as possible to our customers, the packers, who pack everything from Alaska salmon in Alaska to beer, lubricating oil, fruits, vegetables, milk or what have you. We make cans by the billions. We employ 26,000 people. Our 1951 sales grossed over $460,000,000! An operation of this size can stand or fall on its communications.

(*Continued on page 50*)

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Air Fleet for Business

(*Continued from page 49*)

The philosophy behind our fleet of airplanes, therefore, is to provide a small personalized airline—an airline that is on tap by lifting a telephone off the hook. This little airline is geared to take all the tension and confusion out of traveling. It goes straight through to whatever town or rural community our people must reach, without layovers, changes of planes, tickets, baggage checking, or any other inconveniences. We do not wish to minimize airline travel. Our people do plenty of it, and have no complaints at all. They also ride railroads, taxis, buses and subways. These modes of transportation are the backbone of the U.S. traveling equipment. Our aviation department *supplements* these standby services, and we make no claim that it *replaces* them.

However, for the job our little company airline is intended to handle, our fleet has proved both useful and practical. All top-level management from our Board Chairman, General Lucius Clay and our President, Mr. Hans Eggerss, on down the line, use our planes and use them hard. Key people in all branches of our business are carried: engineering, production control, sales, industrial relations, can equipment service, credit, traffic, purchasing, accounting, war-contract work, etc. We have a conservative flight policy. We do not operate any single-engine equipment because we do not feel that we should operate "over the top," in an overcast or at night without the added safety of the extra engine. We fly 50% at night because we can utilize the hours our offices are closed to carry busy executives to their destinations. We thus save an appreciable amount of time and money. The busy executive's day is fully utilized without loss of time and energy, by being able to proceed in his travel when he has finished his mission.

For example, we operate our B-24 *Liberator* about 80% of the time on sleeper hops, most of them non-stop coast-to-coast. The B-24 has six berths plus two reclining chairs. Twelve hours after we break ground in Morristown, we usually find ourselves over the outer marker beacon at San Francisco, California. Since the company has a great many important facilities up and down the West Coast, this non-stop sleeper hop is one of the most popular and useful trips we make.

We normally cruise the *Liberator* at 225 mph true airspeed at 10,000 feet, pulling 600 hp from each engine, burning 190 gallons of gasoline per hour and having a practical range of 3200 miles with ample reserve gasoline to get us to an alternate airport. We cruise the *Lodestar* at 225 mph true airspeed at 10,000 feet, pulling 700 hp from each engine, burn 110 gallons of gasoline per hour, and have a range of 1200 miles with ample reserves. We cruise the Twin-Beech at 200 mph true airspeed pulling 300 hp from each engine at 10,000 feet, burn 45 gallons per hour and have a safe 1,000-mile range with reserve fuel. All our planes are equipped with oxygen for passengers, crew, and we use it above 10,000 feet.

Our field minimums are as follows:

We operate the B-24 in and out of hard-surfaced fields with 1600 gallons of gasoline on a minimum 3700-foot runway. We use the *Lodestar* on 3,000-foot minimum runways (preferably hard-surfaced) with 500 gallons only. We operate the Beeches out of grass fields down to 2500 feet with an 8,750-pound weight restriction in such fields.

Our planes are fully instrumented for instrument landings, blind flight, and carry omnirange navigation equipment and double installations of vital sending and receiving sets which would cause hazard in case of failure. As a matter of fact, we were pioneers in the use of omnirange, having one of the first sets ever issued by Aircraft Radio Corporation of Boonton, N. J. When we put this set in, there was only one omnirange sending station in America, at Allentown, Pa. Now, of course, there are hundreds. We still use our original set, ample proof, we feel, of its sound engineering. At the present time there is no H-facility at Morristown but we have hopes that one will come in the not too distant future.

We fly the B-24 and the *Lodestar* an average of 50 hours a month, and the two Beeches about 60 hours each. We utilize 50% of the seats of all aircraft on an average, and our deadhead traffic is in the neighborhood of only 5%. We feel, however, that our planes are to use, not to keep inside the hangar for polishing purposes. We do not hesitate to fly a single person anywhere in the United States at any time when there is need for the trip. Our costs might look high to some people. We figure that it costs us about 18 cents a passenger mile. However, we think this is cheap, all items considered. Salaries of executives who gain hours and days on the job due to our quick trips come to a considerable figure over the course of the year. Then, too, how can you say how important it is for Continental engineer to arrive 12 hours ahead of time at a distant canning factory faced with a crisis which might wipe out many thousands of dollars of perishable foods unless a quick solution was presented? You can't figure these things in pennies per passenger mile. You have to figure them in thousands of dollars worth of customer good will—the one commodity without which nobody can operate for long.

MACKAY TROPHY *for 1951 was awarded to Col. Fred J. Ascani for setting a world speed record of 635.6 mph (in an F-86) in the 100-kilometer Closed Course competition at National Air Races in Detroit last year*

We are spread from Mexico to Alaska, from Maine to Florida and all points in between. Getting key men to these out-of-the-way points in a hurry, clear-headed and alert, looms very large indeed in the thinking of our top executives. They are thinking in dollars and cents, too, not in terms of wild-blue-yonder romantics.

Continental employees who fly our planes are permitted to bring their wives when space permits. It has been amply demonstrated that the little woman exerts a powerful influence on the efficiency of any man she happens to be married to. If he's out of town on business half the time and she has to sit home and twiddle her thumbs, things will not not be as smooth on the domestic front (and hence in the office as well) as they might be. However, when a man's wife can go along and see the sights in a distant city while he is attending to business details, the trip becomes a real pleasure for the wife. Most women we've flown have been enthusiastic and pleased.

We've set up an alert of one hour before flight time for the crew, 15 minutes for the passengers, and seldom are we kept waiting. We serve hot or cold meals aloft, purchased from professional airline caterers. No alcohol is permitted. Washing, toilet facilities and shaving facilities are available on our B-24 and *Lodestar*. The crew makes up the bunks on the B-24.

Our conversions have all been made with an idea of providing the utmost in comfort and roominess without going to a lot of ostentatious show. We have first-aid equipment aboard and our crews are trained to take care of any emergency which might arise in flight. Luckily, nothing more serious than a rare bout of airsickness has been encountered. The *Lodestar* and the two Beeches require two pilots only. On particularly long flights in the *Liberator* we sometimes carry three pilots so that one man can get some sleep between hitches. Company automobiles usually meet our passengers at the airports and whisk them off, bag and baggage, with no fuss, tipping or wasted time.

Insurance is taken care of automatically by the company. All flight personnel are covered by a $25,000 death or dismemberment policy. All passengers are covered by a $50,000 seat insurance policy which provides $200 a week for 52 weeks in case of partial disability. Our annual insurance premium of $37,000 indicates the thoroughness with which this important phase of our operations is handled.

Flight priorities are based on a combination of business urgency and the position in the organization of the passenger. For example, if a vice president and some one of his subordinates both had business of equal importance, the v p would get the seat—but if the subordinate definitely had red-rush business, the v p would step down and let him fly away. Heads of departments assign priorities to their employees.

The aviation department is on call for flights 24 hours a day. Maintenance work is done in the daytime, however, unless a definite emergency arises. Our maintenance men have no trouble keeping busy. Safety, above all else, is our goal. We are constantly checking and rechecking all vital parts, replacing long before there is any critical need for so doing, and overhauling the planes for cleanliness and appearance as well, since the immaculate appearance of our planes at an airfield is a direct credit to our company and we know it.

We pay the town of Morristown a percentage on gasoline and maintenance. Our employees live within easy commuting distance of their jobs in a smoke-free suburban neighborhood of excellent schools, churches and entertainment, within easy commuting distance of New York City. We know that this sense of permanence in a fine community and in a stable worthwhile job is bound to improve the working qualities of our personnel.

We are frankly quite proud of our new hangar and our new equipment which is the latest and best that money can buy. Our maintenance shop is equipped for welding, riveting, dimpling, bending, beading and woodworking. We have a number of large tools fixed in a place, plus a complete assortment of hand tools needed to handle any sort of maintenance work short of major overhaul (which is usually done by the manufacturer anyhow).

Our hangar has a smooth 4,000-pound test "hard-trowled" concrete floor with an area of 28,800 square feet, plus 75,000 square feet of hardstand for tie-down outside in hangar. The building is of laminated wood-truss construction. In shape it resembles an enormous Quonset, with an arch 180 feet wide by 45 feet high. We provide air-conditioned locker rooms, offices, showers, washrooms, a large parts department and a coffee mess complete with brewing equipment and a refrigerator for snacks during the regular coffee breaks in the morning and afternoon.

One section of the hangar is devoted to engine build up—the attaching of the many necessary bits of equipment after an engine comes back from a major factory overhaul. We also operate a paint shop to keep our equipment in shiny brand-new condition inside and out.

We are now starting on-the-job training for ground personnel. All our employees enjoy the pension plans, hospitalization, free life insurance and other benefits accruing to all Continental Can Company employees. We are looking for serious capable career people, and have taken pains to see that we get them. Aviation has long ago passed through its trial period in our company. It is now permanently established as a necessary function of our operations. We are in business to stay, and to expand and improve our fleet with the needs of coming years.

Navigation Lights

(*Continued from page 16*)

than brightness of the exterior lights."

So it's been every engineer for himself in the confused scramble to improve visibility. For example, TWA's engineers have installed two lights in the noses of their *Constellations*, Martin 202A's, and Martin 404's. One is a red "passing light" with a beam candlepower of 10,000. The other nose light is a high intensity white light for recognition, particularly in the traffic pattern.

Capital Air Lines' engineers have installed a rotating Astra-Dome on their DC-4's. United has fitted out its entire fleet with the new Grimes 100 W, 18,000-candlepower rotating beacon. And the executive aircraft pilots have "lit their Christmas trees" with whatever the CAA would certificate in an attempt to get some peace of mind in the rat race over big city airports.

So, as they say at political conventions, "confusion reigns." And small wonder, considering the problems that face the lighting engineer. First, space. Because the genie, Lift, demands thin wingtips, the lighting engineer must cut down bulb size and wattage and, therefore, candlepower. Even in the leading edge of wings, big lights are out because of de-icing boots.

Second, weight. Let no lighting engineer add more than a handful of ounces to the already gadget-glutted airplane of today. Again, big bulbs for increased candlepower are out, as are heavy rotating mechanisms and large lenses.

And, finally, power consumption. Somewhere down the line there's a public relations veep who's certain that in today's liner—be it airline or company-owned—an extra cigarette lighter in the aft lounge is more important than increased voltage in the exterior lighting system. And besides, look at what the reflections of that flashing monstrosity will do to sleeping passengers.

So purely physical difficulties abound, not to mention the complexity of meeting all human requirements. For example, pilots generally like a non-flashing light because it gives them a quicker and surer indication of an approaching plane's bearing, direction, and distance. Yet they call for a flashing colored light over cities where myriads of steady lights make a confusing background. To all of which the ALPA added a suggestion some time ago that planes flash navigation lights in code to indicate that passengers were aboard.

But through all the confusion there has been some direction and purpose. As far back as 1919, a convention in Paris recommended international uniformity in exterior aircraft lighting. The convention went on to specify red and green lights for the wingtips with visibility through an arc of 110° and white for the tail with visibility through an arc of 140°.

In 1934, an Aeronautical Bulletin required all planes to carry a red light of at least 32 candlepower. Although the Bulletin did not specify a definite position, one air-carrier installed theirs in the right landing light recess and it became common practice. Pilots dubbed it a "passing light." And so it is still called.

By July of 1941, a poll of pilots showed that most were satisfied with the candlepower of the wingtip lights on air-carrier aircraft, but 154 out of 204 felt that the candlepower of tail lights should be increased. As for the lighting intensity of non-air-carrier aircraft, the pilots almost unanimously cried, "Inadequate."

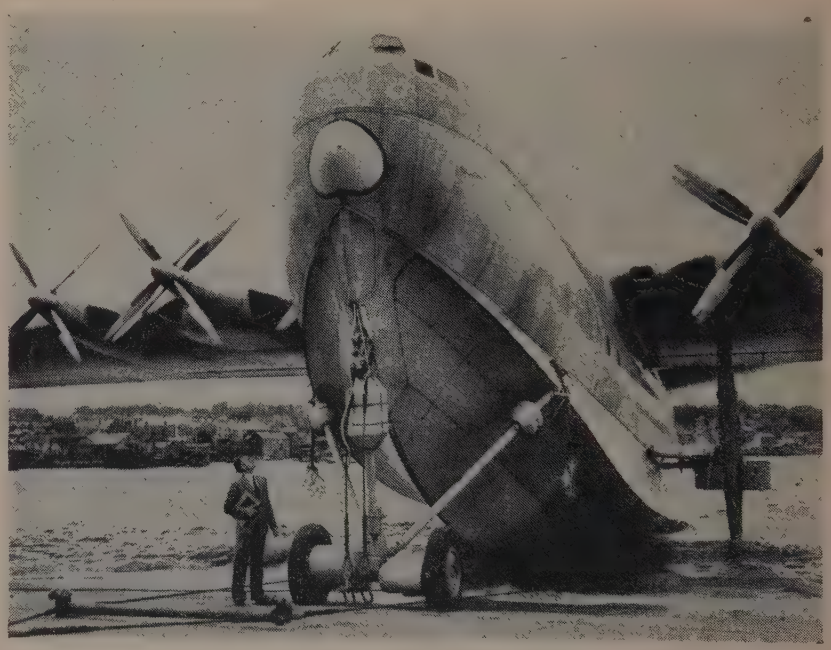
Agitation and anxiety were mounting. Pilots asked for a minimum of 40 candlepower in all forward lights. They stated definitely that all planes should follow the same lighting procedures. And they felt that the tail light should flash on and off.

The industry was ripe for change then, in February of 1942 when observers in an American Airlines plane picked as the most visible of several combinations the light pattern used today—white tail light and red and green wingtip lights flashing simultaneously, then the simultaneous flash of top and bottom white fuselage lights and red tail light. By December of 1942, the Air Transport Association of American suggested that all its members adopt the system. And they did.

In the system as adopted, pattern of flash

TURBOPROP TRANSPORTS

Two of the many aircraft on display at the SBAC Show at Farnborough, England were the Saunders-Roe *Princess* (*below*), a 105-passengers turboprop flying-boat transport, and the Bristol *Britannia* (*above*), also a turboprop transport. The *Britannia* is powered by four *Proteus* units, each developing an equivalent of 3,780 hp. This air transport, on order by BOAC, is capable of carrying 50 passengers on long-range flights; 100 on shorter range trips. *Princess* is powered by 10 *Proteus* units.



is rigorously controlled. The red tail light, for example, is on .625 seconds and is dark .208 seconds; the white tail light is on .625 seconds and dark .042 seconds. The dark period between the red and the white flash is longer because red tends to "hang on" and blend with the following flash. The resultant pink was apparently unbecoming.

Meanwhile, experimentation goes on today. Among the most active groups besides the CAA at its Technical Development and Evaluation Center at Indianapolis is the AMEL at Philadelphia. Fred R. Brown and David Alsher have long believed and are slowly proving that the "point" lights used today betray and confuse pilots. Their answer is to light contours of stabilizer and wing surface.

They outlined entire wingtips, for example, with sanded lucite and installed six small bulbs behind the plastic contour so that the whole tip glowed. They outlined the trailing edges of fins and elevators. They even tried floodlighting parts of the plane. And, although Brown and Alsher were trying to improve exterior lighting for formation flying, their test pilots' obvious preference for "linear lighting" indicates the "point" system may indeed be outmoded.

Other experiments by other engineers have included use of high intensity flash-type gas tube lights like neon tubes. But, although there was less drag, the system weighed far too much.

In the summer of 1949, a 10,000 beam candlepower red light was installed in the nose of an experimental DC-3. The unit was made to oscillate over a 120° arc with a resultant eye-catching flash that was visible for 18 to 20 miles through light smoke haze. But as the haze increased, the light reflected disturbingly back into the cockpit.

So there has been continual experiment, but on widely diverging paths. And to such lack of standardization, the uninitiate sneers, "Why bother with all this lighting claptrap? What's the matter with airborne radar?"

The answer is "Plenty." Although our military forces and the British use it, present units require constant monitoring by a trained operator.

Airborne radar is inadequate, too, because although the scope shows objects within the entire 360°, the unit reflects only objects that are at the same altitude. What's more, it indiscriminately picks up planes that are going away as well as approaching. And its range is limited to 20 miles, with somewhat better performance over the ocean.

Present weight and cost of airborne radar are prohibitive. Today's SC-42 weighs in at 250 lbs., and the airlines figure that it costs them $600.00 per pound over the average life of the plane to lug the thing around. And it is unreliable. Tubes blow too frequently, forcing the aircraft to complete its run with 250 useless pounds aboard.

But planning goes on, because radar—even if it's in the far future—is probably the only answer to the problem of high-speed aircraft visibility in today's glutted traffic patterns. The ATA has laid down specifications for future airborne radar, calling for a maximum weight of 100 lbs., two wave bands—where present Navy equipment uses six—and a simplified antenna and scope.

If radar is a thing of the future, what about now? What are the best lighting procedures known today? What can airline and business fleets—contingent on CAA approval—do to improve exterior lighting?

Noting the most recent experimental findings, the answer is that they will first of all equip their planes with steady, instead of flashing, top and bottom fuselage lights, for such continuously burning lights best give a plane's position. The fleets will move their tail lights several inches apart, for such separation of alternately flashing tail lights best gives a plane's altitude and distance. They will set their navigation lights to flash at a rate of 72 to 120 times per minute, with the ratio of flash length to darkness about two to one. They will use a flashing system in which there is no time at which all lights are out. And they will concentrate their high intensity lighting—despite the space and weight limitations—in the wingtips. For almost all tests show that the tip of the wing is the most effective position. Second choice is atop the fin.

The new Grimes rotating navigation light that United has recently installed on the dorsal fins of the planes of its entire fleet is a long step toward greater safety. It contains a 100 W PAR-36 lamp of 18,000 candlepower. Suspended above it are two reflectors, one forming a beam 20° above and below the horizon, the other, diametrically opposite, forming a beam 5° above and below the horizon. The whole unit is encased in a red plastic globe. Reflectors revolve at 40 rpm. Since they overlap 5° at the horizon, the light flashes twice as often when the plane is at the same altitude as the observer.

The new installation has been seen for more than 70 miles—from Fort Collins to Denver—in less than CAVU weather.

American Airlines has said that it is "partial to the Grimes fin revolving light. The unit has been approved by the equipment committee and is awaiting CAA approval." And Charles Froesch, Vice President in charge of engineering at Eastern Airlines, says that Eastern is "seriously considering the new Grimes light with revolving reflector to replace our present flashing navigation lights because of its better visibility."

Slowly bringing order out of the lighting chaos, Grimes is already developing a better light, this one for the wing. As Lewis B. Moore says, "We've tried to keep the unit as small as possible, but by slightly increasing the size of the lamp and by molding a special type of glass envelope, we've been able to better control the light output and provide four or five times as much light in the area directly ahead."

Mindful perhaps of the increasing tangle of high-speed aircraft blackening today's skies, Moore adds, "Of course, an increase in light output of only four or five times is but a step in the direction toward the much brighter signal desired by pilots."

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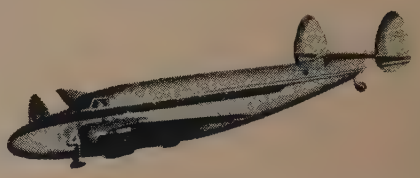

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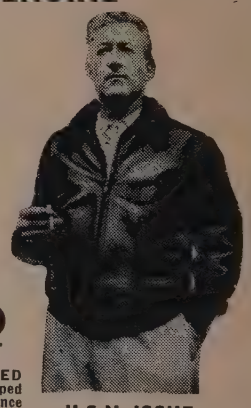

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Report on Farnborough

(*Continued from page 39*)

larly as the wing loading is such that there should be plenty of "stretch" available to take care of future developments. One of its stable companions, the twin-engine, twin-rotor Bristol 173 helicopter, was also a most interesting machine. This 10/12 seater, fitted with two Alvis *Leonides* engines (an engine which was in considerable evidence throughout the display) is, I believe, the first twin-engine, twin-rotor commercial helicopter to fly anywhere. And it appears to fly well. When watching other twin-rotor machines in the air, they have sometimes shown indications of control problems, perhaps due to the difficulty of synchronizing the control of both rotors, but this does not appear to be the case with the Bristol, which was handled with the smoothness and accuracy one has learned to associate with single-rotor types.

De Havilland, as one would expect, had several aircraft in the flying display and on the ground. The *Comet*, fitted with two "Sprite" de Havilland rocket motors, showed what could be done in the way of rocket-assisted take-offs. The ground run was remarkably short, but some passenger education will be necessary if they aren't to be upset by the noise and smoke! The ill-fated D. H. 110 was also most impressive. By the time this article appears in print a further report on this accident will probably have been issued so it would not be proper to comment upon it now. Nevertheless, and whatever the cause may have been, this machine was one of the most outstanding ones in the display. The Gloster *Javelin*, its chief competitor (both are all weather day and night fighters), and for which an RAF production order has been received, was also flying. This delta-wing aircraft, fitted with two Armstrong Siddeley *Sapphires*, is the most powerful fighter of its kind anywhere. It is not a true delta in the full sense of the word inasmuch as it has an auxiliary swept tailplane on top of the vertical fin and rudder. When viewed from underneath, this gives it a strangely dart-like appearance and is reminiscent of the paper models one made at school. Although this machine was not flown at such high speeds as some of the others, its maneuverability was well demonstrated. The Hawker Company—who are also part of the same group of companies as Gloster—showed the *Hunter*, a beautiful sweptwing fighter which is now going into "super-priority" production.

But good as all the foregoing military demonstrations seemed, they were—for the writer anyhow—eclipsed by the arrival, appearance, and flying of the Avro delta bomber. This large aircraft, piloted by W. Roby Falk, flew over the field from its base at the RAF experimental station at Boscombe Down and was most admirably demonstrated, despite the fact that it had only had a few hours in the air. Painted pure white and of perfect delta form, it was tremendously impressive. Although it was obviously much faster than its size allowed it to appear (for its two accompanying Avro experimental delta research aircraft seemed to be hard-pressed to keep up with it), it was the slow-flying demonstration, complete with gate-type air brakes, that really made the crowd sit up and take notice. As this machine was on the secret list few details of it were published, but there could not have been anyone on the airfield who remained unimpressed It is still too early to say whether or not the delta plan form will be the final answer to our high-speed problems, but there can be no doubt that this phase of development which is being pushed ahead in England, side-by-side with the sweptwing designs, is of great importance. If successful, it is certain to have an effect on future commercial designs, and the A. V. Roe Company is said to be already thinking of a civilian version.

Perhaps the next most impressive and certainly the biggest machine was the Saunders Roe *Princess*, a 315,000-lb. flying boat powered by 10 Bristol *Proteus* turboprop engines. These engines are almost completely buried in the wings in six nacelles, two single power units in each of the outboard positions, with the others coupled in pairs and driving contra-rotating propellers. The extreme cleanness of this aircraft, and the majestic way in which it circled the crowd, was most exciting. Whatever the commercial economics of this type may be—and that is a subject which is hotly debated—there is no doubt of the beauty and efficiency of the design. It made other flying boats look clumsy by comparison. Lastly—but not least on this list—comes the Vickers Armstrong contingent, the *Valiant*, the *Viscount* 48-seater turboprop airliner, and the remarkable sweptwing *Swift* single-seater fighter—another type which is going into production as a "super-priority" aircraft. Few details have been given about the *Valiant*, except that it, too, is going into production, but one is always struck by the beauty and grace of this type. As for the *Viscount*, this is well-known now, and British Airways are about to put it into service—the World's first propeller-turbine transport to be so used. To gain experience they have been running their DC-3's with Rolls Royce *Dart* turboprop engines on a night cargo service between London and Paris. By next summer, therefore, not only should British Overseas Airways' *Comets* be firmly established on the Empire routes to South Africa and the Far East, but the *Viscounts* should be carrying full loads between London and the Continent. The impact of this turbine era on the paying passenger will be very great. However good and however economic and however trouble-free the modern piston-engined transport may be, it cannot approach the turbine designs for passenger comfort. In the final analysis it will be the demands of the man who pays the fare that will decide what types an operator is to use. In the words of a well-known International operator, after he had watched the Farnborough Display. "I am now in the position of a man who has found a blonde in a bar. I must go out and get some money."

Cruise Control

(*Continued from page 15*)

be as little as slightly over five pounds per gallon, up to as much as slightly over six pounds per gallon. This is an important factor in getting the most miles per gallon, since an engine uses the fuel by weight rather than by volume. Because you buy gasoline by the gallon and use it by the pound, you will probably get many more miles to a tank of gas in the winter than in the summer.

For the most efficient power setting, the mixture should be set so the fuel-air ratio, by weight, is .067 pound of fuel to a pound of air. To either side of this setting, rich or lean, power will be lost. On the lean side of best power, there is too much air for the fuel and the air cools the gases; on the rich side of the best power setting, there is too much fuel and the fuel cools the gases. This can be seen by consulting the fuel-air ratio chart (*Fig 2*).

For best power an accurate setting of the mixture control is very important. On aircraft with a manual control, the mixture should be reduced until the engine runs rough, then pushed back just enough to make the engine run smooth again. On airplanes with automatic setting, the mixture should be pre-set to the best power position. This can be checked by enriching the mixture with the primer switch. If this results in a loss of power, the mixture is properly set. If this procedure results in a gain of power, the mixture is set too lean and the carburetor should be adjusted. A richer mixture is always used with climb power to aid in cooling the engine.

All of the cylinders of an engine do not receive the same fuel-air ratio, and this means that the mixture has to be set so the cylinder running most lean will get enough fuel for best operation. Consequently, the average engine fuel-air ratio will operate between .070 and .080; or somewhere close to letter "B" on the fuel-air ratio chart, rather than the best power setting at "A."

The specific fuel consumption of an engine is the number of pounds of fuel used per brake horsepower per hour. The specific fuel consumption for an engine must be determined before a cruise-control chart can be developed for any airplane. *Fig. 3* is an example of a typical specific fuel-consumption graph. This graph was prepared by Northwest Airlines for its Boeing *Stratocruisers*. In spite of the size of an engine, the specific fuel consumption varies very little. It takes a certain amount of fuel to develop one horsepower for one hour, whether in a 65-hp engine or a 3200-hp engine. From the specific fuel-consumption curve, it can be determined how much fuel, by weight, that the engine will use per hour for any given horsepower used.

Speed-Power Curve

The next graph of interest in cruise control is the speed-power curve. The speed-power curve is determined by flight test by

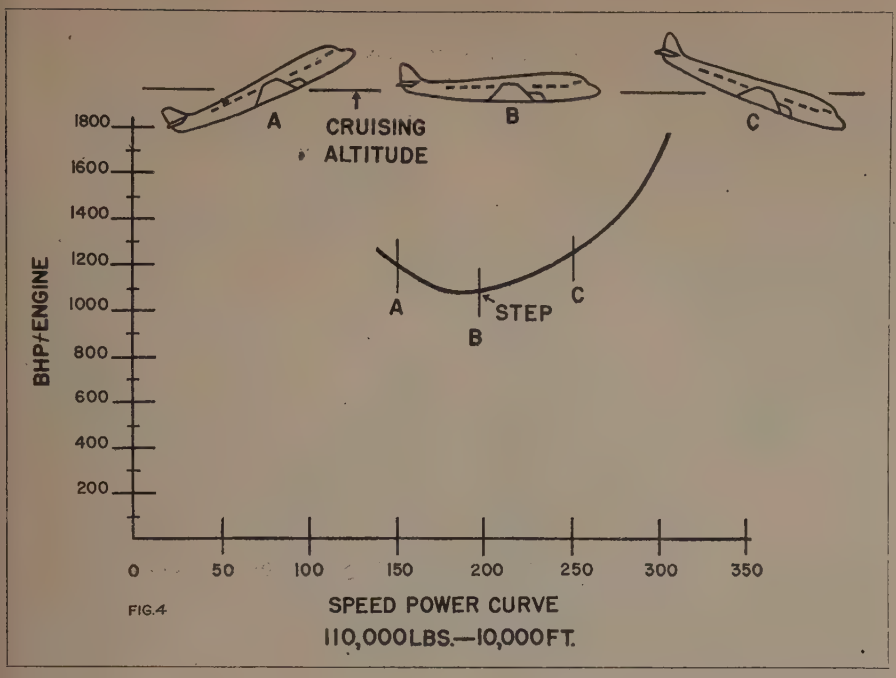

FIG.4

the manufacturer. This flight test is necessary for any airplane, because the same engines pulling the same horsepower on two different type airplanes will result in different speeds and different ranges.

Fig. 4 is a speed-power curve developed for the *Stratocruiser*. This curve is dish-shaped. Point "B" of the curve is that point at which just enough power is being pulled to keep the airplane in level flight. This point is known as flying the "step" and is the most efficient point at which the aircraft can be flown. If airspeed is lost, lift is also lost. This loss of lift will require an increase in the angle of attack to maintain altitude. When the angle of attack is increased, power must also be added. It can be seen from this, that this airplane is in a nose-high attitude and will only be getting 150 mph. With the same horsepower this airplane could get almost 250 mph if the airplane is gotten over its "step." It is always more economical to pull enough power to keep the airplane on or ahead of its step. Whether in a climb, cruise or glide, any airplane will have a definite speed at which it is most efficient. This speed will vary with weight and altitude. The main object of any cruise-control chart is to keep the airplane at this most economical point "B," or someplace between "B" and "C" on *Fig. 4*.

An increase from point "B" to point "C" in power results in an increase in airspeed, but the relative increase in power is always greater than the increase in airspeed. For example, this airplane will increase from 200 mph at 1100 hp to 250 mph using 1,250 hp. This is an added 50 mph for an extra 150 hp. In order to obtain another 50 mph, it would be necessary to add an additional 500 hp. It is easy to see that the most economical and efficient operation is obtained just at or just ahead of the step.

Fuel-Mileage Curves

By using the speed-power curve and the specific-fuel-consumption curve a fuel-mileage curve can be developed. This fuel-mileage curve will give the range of the aircraft at all power settings and will be different for all altitudes and gross weights.

Cruise-control charts are simply a collection of fuel-mileage curves assembled so the pilot can use them for a quick reference. The fuel-mileage curve will be affected by gross weight, altitude, cowl flaps, winds, flight attitude, trim, carburetor air temperature, and icing. Of these, gross weight is the most important. The higher the gross weight, the more power will be needed to keep the airplane on its step. An increase in altitude will require an increase in power to maintain the airspeed necessary for the most economical operation. This is offset somewhat by the fact that the engines will produce more horsepower for any given setting at higher altitudes than at low altitudes, due to a decrease in exhaust back pressure.

Use of cowl flaps or carb heat will require additional power to maintain airspeed. Headwinds will also require a slight amount of increased horsepower for maximum range. Flight attitude is important as seen on the speed-power curve. First consideration is proper trim. An airplane improperly trimmed can easily lose 5 mph. Center the ball with the rudder trim first, then trim for hands-off flying with the aileron trim. The second consideration is getting the desired airspeed as soon as possible. This is done in two ways: first, by climbing the plane a few hundred feet above the desired cruising altitude, then diving down to the cruising altitude to obtain the airspeed. The second method is leveling off at cruising altitude and leaving climb power on until the desired airspeed is reached. Of these two methods, the first is more widely used.

Types of Cruise Control

There are several different types of cruise

(*Continued on page 56*)

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Cruise Control

(*Continued from page 55*)

of its simplicity. A cruising horsepower is picked that will keep the airplane well ahead of the step at all allowable gross weights and altitudes that are normally flown. This horsepower is usually about 60% of the rated power of the engines being used. This constant horsepower method can be used on any type of airplane, and has the advantage of being simple enough for the pilot to remember without referring to a cruise chart. When it is determined what horsepower is to be used, and what manifold pressure and rpm is needed to produce this power at sea level, the pilot simply reduces .3 inches manifold pressure for every thousand feet of altitude. This, of course, is only approximate since the engine works on density altitude rather than indicated altitude. Temperatures other than standard will also cause some variation.

The constant instrument airspeed type of cruise control is sometimes used. In this method, an airspeed is picked that is ahead of the step for the altitude and gross weight being used. This method requires much more attention from the pilot and gives very little more range. As the weight is reduced by the burning of fuel, the pilot has to reduce power so the indicated airspeed will remain the same. The actual range is not increased too much over the constant horsepower method, and requires much more work for the pilot.

Maximum-range cruise control is most desirable from a standpoint of distance, but means operating the airplane on its step. This procedure requires constant attention of the pilot as well as perfect flying technique. If a slight amount of altitude is lost and the pilot pulls the nose up to get it back, the airplane will lose airspeed and fall in the bracket back of the step. This will require adding power to get the airspeed back to the step and its a resulting loss of range.

Most long flights where maximum range is required, use the 110% of maximum range method of cruise control. This keeps the airplane just ahead of the step at all times and does not require constant attention of the crew to keep it there. It doesn't have quite the range of the maximum-range method, but is more desirable due to its ease in flying. This method requires a reduction of power every hour or so as the weight is reduced. If any headwinds are encountered, it will only tend to move the range closer to the maximum; since, with a strong headwind, using the maximum-range method would require a slight increase in power.

Regardless of the type of plane being flown or the distance of the flight, some type of cruise control should be used. There will always come the day when the pilot will want to stretch that last mile out of the gas available. A working knowledge of cruise control and its application will save many gallons of fuel and add many hours of life to the engines.

STRATO-LAB *at AiResearch Manufacturing Company in Los Angeles, re-creates "the upstairs" on the ground. In this compartment technicians simulate flight up to 1200 mph at 75,000 ft.*

Fly Higher and Faster

(*Continued from page 27*)

you get a cockpit temperature of 1800°, nearly enough to melt iron!"

The problem posed by Garrett is not so far around the corner. Early last summer Bill Bridgeman in a Douglas *Skyrocket* streaked 1,238 mph, twice the speed of sound. He would have roasted in his cockpit except for a phenomenon known as "heat lag," the time it takes ram heat to penetrate inside the plane. The pilot played it safe and flew only one minute at top speed.

Without waiting for tomorrow's air headaches, Garrett has plenty of them in today's speeds. Each problem has called for a new gadget, and each plane for a special model of each gadget, with the result that the AiResearch line includes 700 different products. The company sold $65,000,000 worth of them last year to aircraft builders and airlines, and has a $145,000,000 backlog of orders on the books.

Cliff Garrett was born in Seattle in 1908; some years later the family moved to Los Angeles. The death of his brother, a naval flyer, determined young Cliff to devote his life to making flight safer. In 1930 he landed a job at Lockheed, was told to report for work in the stock room. His job was procuring tools and materials, a task that beamed him into his life work.

Three years later, after attending night classes in engineering and economics at nearby UCLA, Garrett went over to the newly established military plane division of Douglas Aircraft at El Segundo. Here again he was assigned to procure tools, materials and accessories. The latter were a problem because suppliers considered the depression-hit aircraft industry too unimportant to justify the designing of special light-weight gadgets to do the work of heavier machines used on the ground. This proved Garrett's opportunity. In 1936 he founded the first accessory supply business catering exclusively to aircraft builders.

At first Garrett had no intention of becoming a manufacturer. Wanting to find out more about the technicalities of flight, he persuaded a group of associates to help him start a research laboratory, and AiResearch was launched in 1938. To establish the venture they could only raise $26,000. "That's all we ever put into the business . . . that and brains and imagination," recalls Garrett, who is always willing to pay a bonus for talent or skill.

After his researchers found the answer to a featherweight heat exchanger to cool engine oil, Garrett had to make the coolers himself because no established manufacturer wanted to bother with the intricate devices. Soon, when planes soared upstairs where jet fuel solidifies like paraffin, the engines needed heaters as well as coolers, so Garrett added heaters to his line.

The gadget that put AiResearch on the map was a cabin supercharger for the Boeing *Stratoliner*. Boeing engineers designed a cabin pressurizer, but shied at manufacturing it because the tolerances were too exact. They called Garrett, who was already known as a push-over for something that couldn't be done.

The superchargers had to be tooled to

tolerances finer than those of Swiss watches. When Garrett told experienced mechanics that he wanted tolerance of eighty millionths of an inch, 15 times as fine as the finest human hair, most of them threw up their hands. Garrett hired a bunch of bright youngsters fresh out of trade schools and indoctrinated them with his ideas.

"They didn't know what was impossible, so they went ahead and did what we told them to do," he explains.

The superchargers, standard now on modern airliners, gave Garrett's people the know-how to build other equipment. As planes climbed higher and dived faster, builders needed controls that responded to atmospheric and temperature changes faster than human fingers react to a red-hot stove. This led to the perfection of an electronic brain which is housed in a little black box five by five by five inches, crammed with a thousand tubes, wires, solenoids and other parts, so sensitive that it thinks and acts for the pilot. AiResearch now puts out three kinds of black-box brains: one for temperature control, one for atmospheric pressure adjustment, another a firing computer.

The company also manufactures a line of actuators which replace pilots' muscles in operation of aircraft controls, and ailerons, rudder and landing gear. At sonic speeds, it takes 80 times as much push or pull to maneuver the flaps, so Garrett's men devised a "Tortional Friction Non-Jamming Actuator." Little motors, no larger than spools, act as mechanical muscles.

With the advent of the turbojet bomber, Garrett had another problem on his hands. The turbojet engine required a hundred times as much power to start as was needed to turn over a conventional airplane engine. Carrying a starter and batteries capable of starting the turbojet was out of the question because of the weight involved. On the other hand, without a means of starting its engine after an emergency landing, a turbojet bomber or transport would be about as helpless as a bale of hay.

Under Garrett's impatient prodding, AiResearch came up with an 88-pound, suitcase-sized gas turbine engine that rates as the lightest and most compact portable package of power yet invented. The diminutive gas turbine, smaller and much lighter than an automobile engine, can turn up as much power as is used on 60 average farms. After it kicks over the plane's engines, it is switched over to generate electric power needed in flight.

AiResearch engineers have already adapted it to one all-important ground use: an Arctic heater for the Air Force and the Navy. In the bitter Arctic cold, airplane engines are so hard to start that at some bases they were kept idling when on the ground. The new gas turbine, hitched to a heating unit about the size of the kitchen stove, heats either hangars or barracks; one of these machines turns out enough heat for a 500-room hotel.

Although he is a crack transport pilot, Garrett never needs to go aloft to observe how his gadgets are working. In their strato-lab he and his researchers simulate on the ground the stratospheric conditions that torment metals, fibers, fuels and oils as well as pilots. Sitting in a specially built compartment, they can simulate flight up to 1200 mph at 75,000 feet and watch what is happening on recording instruments. This strato-lab, which looks like a beat-up old bomber on the outside, can be loaded with any combination of wind, altitude, head and atmospheric pressure, with a dash of clouds, snow or hail added at will.

Garrett's insatiable curiosity and his willingness to gamble big money to get answers to the unknown have rocketed him to the fore in the thin air business. He has few competitors, and none of them offer such a complete line of accessories as AiResearch.

Some of Garrett's ideas for getting along with his workers are almost as advanced as his products. He pays 10% more than other aircraft plants for the same category of work, and periodically re-evaluates jobs to make sure that AiResearch wages are ahead of union scale. There is method in this madness: it lures the most skilled workers in the industry, and twice in NLRB elections, employees have voted down both AFL and CIO efforts to unionize the plants.

"If they want a union, they can have a union," insists Garrett. "But we are going to make sure they have all the facts about the company."

One of his enthusiasms is jigging up precision jobs so that handicapped people can handle them. The company has over 600 of these workers, many of them war veterans. Garrett rates them among his most productive people.

On the job, Garrett virtually knocks himself out, working at high tension. "He knows what's on your mind before you've made it up," an associate explained. Garrett trained himself to read upside down so that he could keep apace of a customer or a co-worker, looking at a report or blueprint on the other side of a desk. He has tried hobbies, such as golf and week-end ranching, as a means of letting off steam, but under his intense drive they soon become serious projects.

Last summer, when Garrett was forced to take time out for a long rest, he did a lot of cogitating about the gadgets required for tomorrow's missiles, which may attain speeds up to a mile a second. At this clip, Garrett thinks earth-made vehicles will wrench themselves free from the Earth's gravitational pull.

"The big problem with them," he muses, "will be to create artificial gravity so we'll have some way to navigate. We're going to have to figure out how to sustain life up there where we can't pressurize because there's no air to compress. Then, how are we going to propel ourselves with nothing to push against? But some of our boys will be coming up with the answers. You can bet that when the first space ship takes off for the Moon, it will be equipped with a lot of AiResearch gadgets."

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MRS. J. FRED HENRY
Publisher

Sworn to and subscribed before me this 22nd day of September, 1952.

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Committee S-7

(Continued from page 21)

pit Lighting for Commercial Transport Aircraft, developed under Scott Flower (issued as SAE ARP 264A). Its purpose is to provide lighting of proper intensity and distribution under all external light conditions.

2. Location and Actuation of Cockpit Controls for Commercial Transport-Type Aircraft, developed under R. L. Thoren (issued as SAE ARP 268). This standard provides a uniform pattern for cockpit controls in all multi-engine aircraft to be built to the same standard.

3. Cockpit Visibility Requirements for Commercial Transport Aircraft, developed under J. B. LeClaire (issued as SAE AIR No. 32). This bulletin is intended to encourage more effort to be directed toward improving the pilot's visibility from the cockpit, so as to improve safety. The report is in general terms, since is was recognized that a rigid specification is undesirable and may restrict development and initiative.

These projects were completed rather quickly, for they had to do with cockpit equipment over which little or no controversy existed.

Other projects on which subcommittees are actively engaged are:

1. Color Coding of Warning Lights and Signals, under C. M. Christenson. The report will cover complete lighting requirements pertinent to such lights, including color and brightness.

2. Cockpit Control Standards for Jet-Powered Transports, under Capt. Scott Flower. This report will parallel the proposal already developed for controls of conventional transports. It will include controls standardization requirements for both turboprop and turbojet aircraft.

3. Cockpit Seating, under O. E. Tibbs of Glenn L. Martin. In developing this report, the committee is considering the following:

A. Seating controls or adjustments.

B. Index location for elbows.

C. Over-all dimensional limits.

D. Requirements of construction, *i.e.* cross bars and protruding bars.

E. The possibility of breaking down the seating requirements according to types of airplanes.

4. Cockpit Instrument Panel Standards, under M. G. (Dan) Beard. This standard is intended to apply only to future designs. It includes a basic layout of instruments and three modifications to take into account the recently developed computer instruments.

5. Cockpit Signal Lights and Audible Signals, under C. M. Christenson.

6. Flight Engineers Stations.

7. Engine Instrument Panels.

As the activities of Committee S-7 have grown, the range of committee participation has also expanded, with the Military Services, CAA, CAB, AIR, ALPA, and others opening active channels of information to aid in the committee's operations. For example, early in 1952 it was discovered that the controls standard (ARP 268) as being developed by Committee S-7 closely resembled in scope a similar document being developed by the Munitions Board Cockpit Standardization Layout Panel. Yet a sizable difference in details between the two documents existed. As a result, liaison membership arrangements were made and two joint SAE Committee S-7—Munitions Board Cockpit Layout Panel meetings were held. It was gratifying at the end of these meetings to see the basic similarity in the two documents and to be a part of the unified standardization effort resulting in, for all practical purposes, a single controls standard insofar as possible.

Detailed discussions at these joint meetings revealed that the differences largely lay in misunderstandings of nomenclature, symbols, etc. For example, it was discovered that Committee S-7 recommended that a bell be used as a warning for fire while the military people use a bell to designate "bail out."

To achieve committee unity on flight panel instrument standards, five lengthy subcommittee meetings have been held. They have been devoted to studying data and ironing out the many differences of opinion.

The subcommittee is leaving no stone unturned in its attempt to secure basic knowledge concerning cockpit instrument locations and arrangements. The members have witnessed demonstrations of the latest versions of computed instrument arrangements. Psychological studies conducted by the military services have been reviewed in detail. Eye movement data as uncovered by motion picture tests have been taken into consideration.

As a result of this study, the subcommittee has decided upon one basic layout of instruments and three modifications to take into account the computer instruments. The layouts consist of:

1. Basic layout of primary instruments for the Instrument Landing System (ILS).

2. Basic layout modified to include the radial magnetic indicator (RMI), which acts as primary directional unit.

3. Basic layout modified to include the Collins computer system, which consists of a Course Indicator and the Approach Horizon.

4. Basic layout modified to include the Sperry computer system, which consists of the flight directional indicator (Zero Reader) and the heading selector. The basic flight instruments have been kept in the three left-most columns of the top and center rows. The remaining positions are used for other instruments, which have been placed in what are considered to be logical positions.

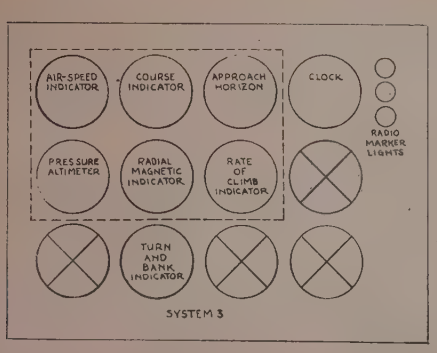
In all four panels, effort was made to retain the same position for the same function, even though, in some cases, it was performed by a different instrument. This is true for all 21 positions, but especially so for the basic flight instruments. For instance, the instrument that tells the pilot his relationship to the horizon is always in the same spot; similarly, for the direction indicating unit.

Originally, the committee had planned to lay out the panel so that the basic instruments would be along the top row, but this idea was discarded because it meant that the instruments would be too spread out.

This standard goes further than any work previously done in this field because of its inclusion of the computer instruments, which are already being used by some airlines and are on order by others.

The standardized layouts are now being coordinated in the air transport industry by the Air Transport Association.

Committee S-7 recognizes the dynamic nature of its work. Cockpit standards, if they are to be good, must be up to date. The cockpit, it is felt, will tend to grow more complex due to the increased number of gadgets that may be needed to control new "performance" devices. Thus, the need for greater effort in cockpit standardization is the direct concern of the committee.



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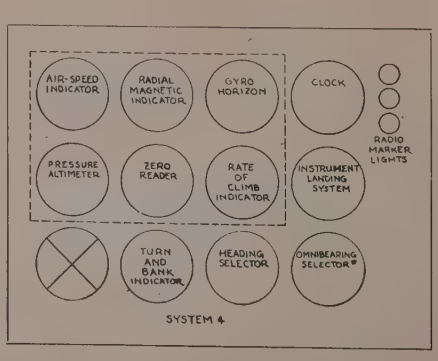

SYSTEM 4

In 1950 R. D. Kelly, Chairman of the SAE Aeronautics Committee, was looking for a man to head a new committee concerned with cockpit standardization. His selection of M. G. (Dan) Beard was very fitting. Beard's cockpit interest extends back to his pursuit-pilot work in the U. S. Army Air Corps in World War I. His extensive pilot experience both in military and commercial planes from the late '20s until the present time, coupled with his technical engineering education and training, fully qualify him as a leader in cockpit simplification work. By virtue of Beard's leadership in the field he was able to surround himself in Committee S-7 with a group of well-qualified technical pilots. He acquired early in his S-7 Committee pursuits the assistance of Scott Flower as Vice-Chairman.—Ed.

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Radio Facilities Changes

CHATTANOOGA, Tenn.—Commissioning of the Glide Path completes the ILS facility here.

CHICAGO, Ill.—Midway tower now adds 119.9 mc (not at Meigs Lakefront as per a recent publication).

COLUMBUS, Ohio—Lengthening of Runway 9.27 completion should see early re-commissioning of the ILS.

ELMIRA, N. Y.—Chemung Airport Tower VHF frequency now 119.1 mc.

GREATER PITTSBURGH, Pa.—ILS Outer Locator on 201 kc (old Pit-Allegheny Middle Locator) instead of 323 kc. Clinton, Pa. MHW keys "GHW" on 293 kc. Experimental MHW 6.5 mi. E of airport keys "GRP" on 323 kc.

ISLIP, N. Y.—ILS on 110.1 mc instead of 110.3 mc.

NEW YORK, N. Y.—MATAWAN VAR next to go if VOR tests at Colt's Neck, N. J. (SW of MWA) are successful. New Rochelle Radio Beacon frequency and type fan marker may be changed and Portchester Marker removed due to several incidents involving pre-mature position reporting and resulting conflict of successive inbound aircraft. Complaints of inability to raise the New York Center far enough out on the West and Southwest approaches may result in an additional remote control transmitter-receiver site somewhere in Eastern Pennsylvania.

NORFOLK-NEW YORK—Amber 9 airway between these points has been cancelled.

Navigation NAVICOM Communication

Vol. 11 Number 12 December, 1952 Navicom Number 18

Answer Offered Problem of Parallel Runway Confusion

With present existing and future planned airports with parallel runways and the increase of landing approach speeds and the resulting larger and more awkward approach patterns, the significance of any item leading to confusion in air-to-ground (and vice versa) communications, such as in airport traffic control, assumes growing importance. More and more pilots are reporting this condition, especially at such large busy airports as Chicago, etc.

In an informal symposium, consisting mainly of interchange of ideas and experiences by letter distribution, the Flight Safety Foundation, (a non-profit industry organization, located at 2 East 64th Street, New York City, and headed up by Mr. Jerome "Jerry" Lederer, long and popularly known in the industry as an expert on flying safety) has accumulated a sufficient number of opinions of experts both in the flying and airport traffic control fields to indicate a possible solution.

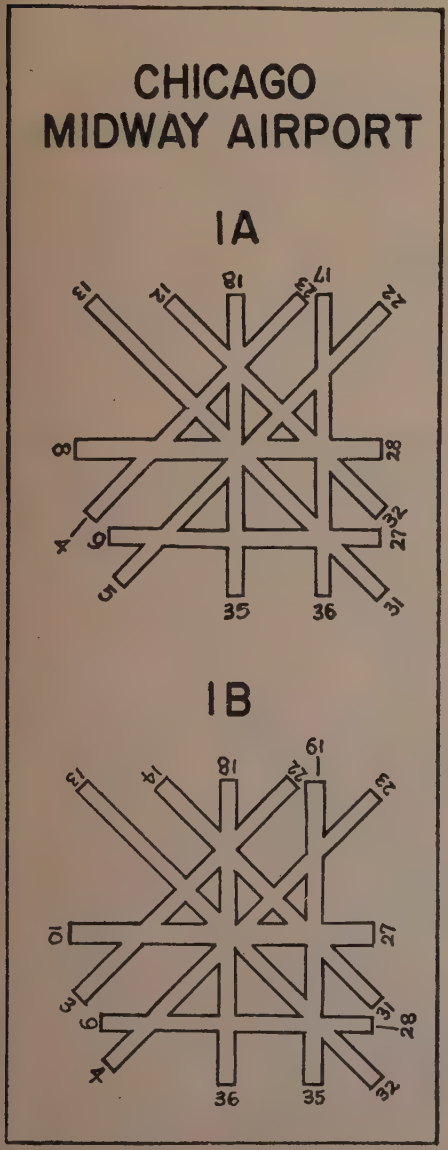
Suggestions have varied from "Rockefeller" and "Lipschitz", facetiously for "Right" and "Left", to Starboard and Port, suggestive of the growing trend to use nautical terms for application to the ocean of air in which we navigate today. An outstanding suggestion was contributed by one subscriber to the Foundation.

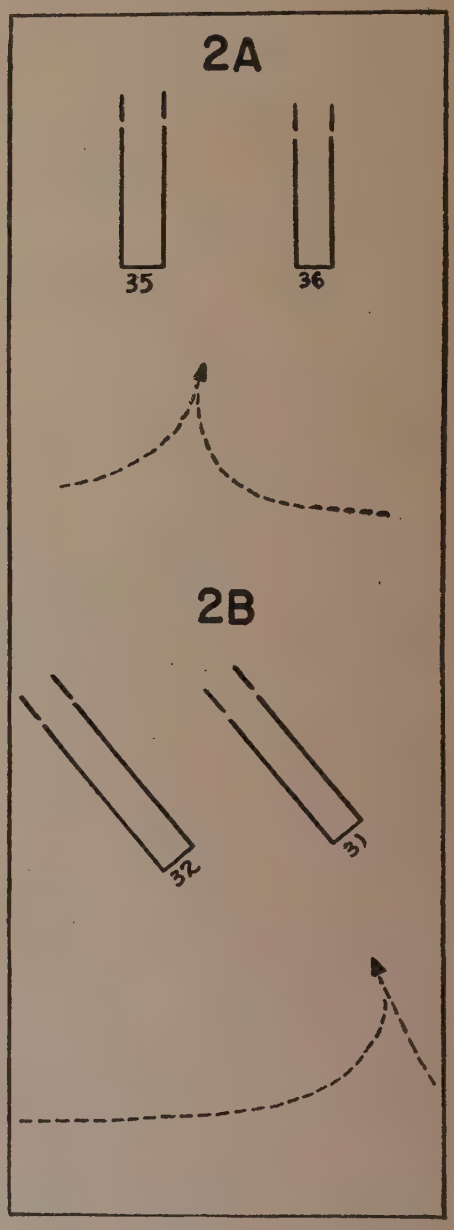
The standard system of runway numbering for some years now has been to employ that basic magnetic direction in tens of degrees on the compass rose, with which the runway is most nearly aligned; as for instance, a runway aligned 044° magnetic is Number 4, the reciprocal or opposite end approach being similarly numbered 22.

Inasmuch as, considering wind drift effect, the value of this system is not too adversely effected by a compass reading on final approach some few degrees off the announced heading number, it should be readily apparent that a number either side of the actual magnetic heading of the runway would be equally suitable.

For that reason, the suggestion that parallel runways in any given magnetic direction be assigned the two 10-degree compass rose figures on either side of the actual direction is as helpful for orientation purposes as a single runway approach and has the additional advantage of natural left-right orientation of lower and higher number when turning on final approach. Visualize landing northeast at Chicago, Runway 4 would be the parallel strip on the left, Runway 5 on the right of the approach direction. If, when landing North, parallel runways numbered 36 and 1 would be confusing, then Runway 35 and 36 would not be and the 10° error, if any, would not be significant. See figures 1A. and 1B.

A variation of this suggestion was to number the two parallel runways one numeral higher, rotating clockwise as the basic system does. As previously mentioned, 4-left would be #5 and 4-right would be #4. See figures 2A. and 2B.





New CAA Safety Office

Los Angeles Regional Administrator of the CAA, J. S. Marriott, announced recently that a new CAA Aviation Safety District Office has been opened in Van Nuys, California, at 7550 Hayvenhurst Avenue.

Winter Air Transport Operations In and Out of New York Area Pose IFR Navigation and Control Problems

The winter of 1952-53 is upon us, bringing with it a tremendous increase in the problems of instrument departures and arrivals in the New York area. Other areas, like Chicago and Los Angeles, have problems too, but all experts, government or private pilots and ground personnel alike, concede that the New York area is the world's worst. The complexities of criss-crossing arrival and departure routes from the three major airline terminals, plus two prominent non-airline airports (which are used heavily by large corporative aircraft) and two major military fields present problems unmatched elsewhere in the world.

It has been computed that over 25% of the country's airborne travelers depart from and arrive in the New York area. Figures for mail, cargo and international passengers far exceed these. The resultant congestion of aircraft necessary to move this traffic is more frightening every day to the experts when CAVU weather prevails, and when IFR weather sets in, traffic controllers and pilots age prematurely.

Even prior to the unfortunate accidents of last winter, over 60% of the total traffic and a similar proportion of instrument arrivals and departures were handled at LaGuardia alone. Numerous approaches to the problem have been tried, including voluntary redistribution of field usage by the scheduled and non-scheduled airlines, corporative and private aircraft. Mainly because of insistence of passenger needs, this method has achieved only limited success. Despite all efforts, voluntary and forced (lease restrictions, etc.), of the airlines, the Port of New York Authority (operates the three major airports: LaGuardia, Idlewild and Newark) and co-operating corporate and private aircraft, passengers of all classes of air travel do not buy the idea of alternate airport usage except for reasons of weather.

The result has been increasing emphasis on improvement and augmentation of the radio navigation and approach/departures facilities to accelerate the handling of traffic during IFR weather. Use of new radio navigational facilities, improved and multiplied communication channels and procedures, and combined use of GCA with other approach aids to safeguard shorter intervals between aircraft on arrival and departure have all contributed to the common effort.

In many instances addition of new facilities, channels and procedures exact such a penalty in further complicating a pilot's IFR problems that it was recognized that other solutions must be found. Re-examination by the most competent CAA, Port Authority and pilot personnel of the whole New York area resulted in a series of proposals to re-align some of the approach and departure lanes, to change navigational and communication frequencies and alter procedures in the hope of achieving more efficient flow of traffic without exceeding budget allowances or increasing the confusion.

Unfortunately, some of the airports were never laid out or constructed with any thought to co-ordination of traffic flow with other airports at a time when approach and climb-out speeds rarely exceeded 135 mph and a 3-mile airport control zone sufficed, plus airline routes almost entirely departmentalized by specific sections of the country. Today, approach speeds and holding patterns have grown, airport patterns and zones are either tangent or overlap, and all the airlines plus non-airline large aircraft operators fly all directions from all of the airports!

Although radar has come into increasing usage to reduce landing intervals at individual airports, and to reduce departure intervals when enroute altitudes are available and only the problem of climb-out separation is posed, the unbelievably high number of aircraft airborne within range of any given radar, plus the lack of such reliable means of confirming target identification as airborne radar beacons and VHF/DF, has so far kept a considerable restraint on this hopeful aid.

Both last winter and this fall, a group of industry and government experts conducted an extensive survey of the problem and came up with certain recommendations. (Reference is made here to the New York Area charts, such as the N. Y. Metropolitan Area Local Chart, the Radio Facility chart 26A, corresponding Jeppesen and other airways manuals.)

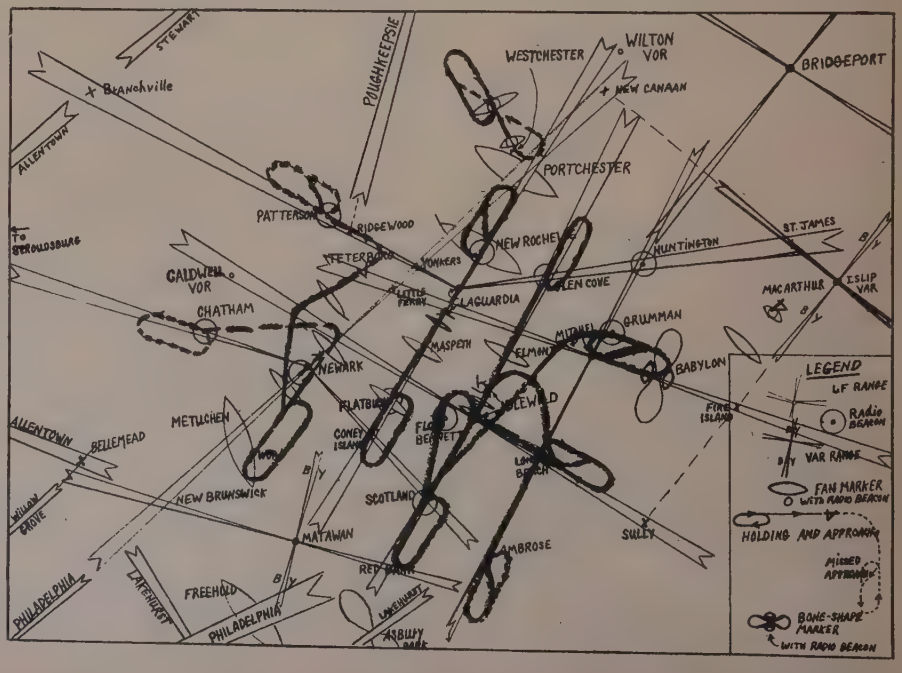
It is not easy nor necessary to recall how the area looked at the beginning of the last winter. It is important to examine the recommendations made at that time and see how closely the objectives stated or recommended therein have been achieved by the outset of this winter now upon us.

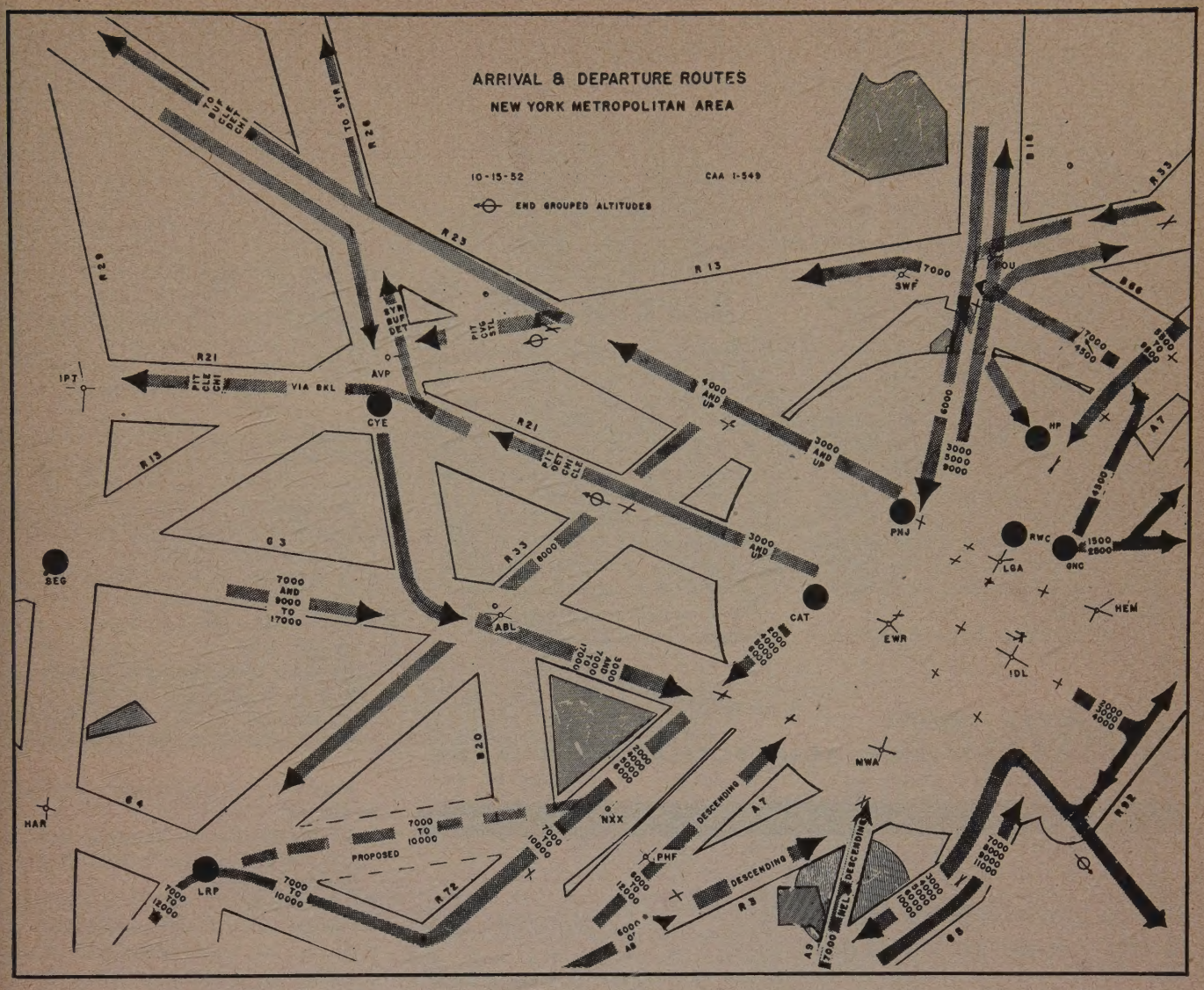
1. Diversion of traffic from overloaded La Guardia to Idlewild and Newark.

The quite familiar practice of the airlines "co-operatively" dropping a few schedules from LaGuardia, moving them to Newark and then surreptitiously sneaking twice as many back when each thought the other's back was turned, was no more effective than before, in the fall of 1951. The non-flying public actually accomplished this objective by forcing the closing of Newark and threatening similar action at LaGuardia following the tragic accidents at Newark. From a multi-million dollar country-and-beach-club of the air, Idlewild began to take on semblance of a commercial airport. Newark, reopened on a limited basis in late spring and with the opening of the new instrument runway #4 approaching over the marshes, should re-shoulder a fair and considerable portion of the burden this winter, using ILS minimums of 200 feet and ¼ mile visibility.

2. Air Force and Navy to change the instrument runways at Mitchel, and Floyd Bennett to northeast and north

POSSIBLE NEW YORK AREA APPROACH PATTERNS—WINTER 1952-1953





respectively, and the reciprocal directions for southwest approaches.

Thanks to the mobility of military GCA units, this change shouldn't present too much of a problem, although the acquiring of suitable approach terrain could be. Mitchel range and GCA approaches are still a factor to be reckoned with at Idlewild, and quite frequently, traffic at LaGuardia is snarled by Floyd Bennett GCA approaches blocking 2500 feet at Flatbush, the "gate" fix for LaGuardia ILS approaches.

3. Install a fan marker northeast of Idlewild to provide a southwest approach on the range and back course ILS.

The Elmont Fan Marker is in operation and the back course ILS approach from Glen Cove holding pattern at 2500 feet (LaGuardia northeastbound departures cross there at 1500 feet), via Great Neck intersection and the Elmont Fan, should be initiated sometime in November. How this will conflict with departures off LaGuardia Runway 13 remains to be seen.

4. Re-align the northeast course of Mitchel range to 220° inbound, to cross the east course of LaGuardia at the Huntington intersection instead of St. James and move the Mitchel MH radio beacon to the same intersection to provide a southwestbound approach fix for Mitchel.

None of this has been accomplished, possibly because of more pressing problems and budgetary or technical limitations.

5. Install an MH facility at the Glen Cove intersection to provide a suitable holding fix at that intersection of the east LaGuardia and northeast Idlewild courses.

This has been accomplished. Within a matter of days, the Floyd Bennett LF range of 379 kc was decommissioned, the frequency installed in a MHW beacon at Glen Cove. Then it was removed to Idlewild range and the Idlewild frequency of 248 kc installed at Glen Cove. So far, the greatest use has been as a holding fix for a climbing pattern to get Idlewild westbound departures over LaGuardia's stacks and as an initial point for LaGuardia east and northeast bound departures. (Floyd Bennett inherited an MH on 532 kc.)

6. A mutual interchange of control of voice facilities of Idlewild range and tower with Mitchel and Floyd Bennett GCA.

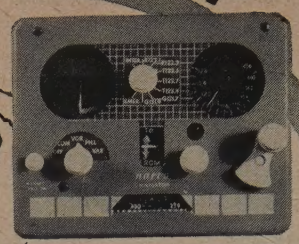
This would enable, with proper coordination, any one of the three operating directly with military aircraft when the situation warrants through the communications and navigational frequencies of all three, during the failure of any one facility or part of one, currently producing a complicated and inefficient tower interphone hassle.

7. Equip the New York Center with additional control frequencies.

The New York Center now has *four* frequencies (and will have more) with which to work inbound and outbound traffic and this has been possibly the greatest step toward faster traffic handling. The scheduled aircarriers of course are equipped, but it would behoove the larger corporative aircraft to acquire multi-channel VHF as soon as possible to expedite their handling at these major terminal areas. Currently, the N. Y. Center usually employs 126.5 mc for eastbound departures, 118.9 mc for north and northwestbound de-

(*Continued on page 64*)

If you fly X-country



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Winter Poses IFR Problems in Operations at New York

(*Continued from page 63*)

partures over Red 23 airway, 118.1 mc for southwestbound and westbound departures over Amber 7 and Red 21, with 120.7 mc for inbounds. All the above are flexible enough for "Center" to interchange as and if necessary.

A newly proposed frequency set-up may be as follows: 118.9 mc,—inbound to Idlewild from northeast, east, southeast and the Scotland holding stack; 120.7 mc—departure from Idlewild; 125.1 mc—inbound to the New York area from the west; 125.5 mc—departures from LaGuardia; 125.7 mc—inbound to the New York area from the north and northeast.

8. Procure and install VHF-ADF equipment at the three CAA Radar towers in the area.

This is probably the one item that is in most crying need and has yet to be resolved. For reasons best known to the military and the suppliers, CAA has not been able to obtain its own or even military VHF-ADF, except at locations where the military shares the airport facilities. With the unbelievable amount of IFR traffic in the New York area, the problem of proper and expeditious radar identification is seriously crippling the efforts of CAA radar to expedite the flow of IFR traffic and relieve the pressure. If a major disaster occurs in which mis-identification of aircraft, whether primarily mislead by faulty pilot report or ground personnel assumption, is a contributing factor, there will be much scrambling between the military and the CAA to justify the withholding of this vital aid so common in much less vital areas in the U.S.

Indicative of this situation is the fact that several close ones have occurred where aircraft on approach have reported inbound over the gate fix based on prematurely received radio indications, and subsequent aircraft, having been instructed to leave the same fix at a pre-determined interval, have showed up on approach at the same time and even ahead of the Number 1 aircraft. It is seriously proposed to eliminate or change one of the two fan markers, New Rochelle or Portchester on the northeast LaGuardia approach, and change the frequency of the New Rochelle radio beacon.

Prominent in the latest discussions was the inevitable re-routings of traffic in and out of the area. The accompanying charts illustrate these two major problems of revision of facilities, approaches and departures.

Briefly, east and northeastbound flights will be cleared:

From LaGuardia, via Glen Cove, Huntington, Bridgeport and St. James north on Green 5.

From Idlewild, eastbound via Sully, Fire Island, Montauk Pt. etc. Northeast via Mitchel and Green 5, or Sully, Red 92 and Green 5. North via Glen Cove, northeast Idlewild, Wilton, Blue 48 and 18.

From Newark, north and northeast via Paterson and Blue 18.

All Flights from Teterboro will proceed via the Newark routings.

All Floyd Bennett and Mitchel flights will use Idlewild routings.

West and northwestbound flights will be cleared:

From LaGuardia, via Paterson, Red 23 and Red 51 or Red 11 northwestbound, and via Paterson, Red 23, Red 13, Red 21 westbound.

From Idlewild, via Glen Cove, Wilton, Blue 48, Red 13, to Red 23 or Red 21 if non-pressurized; and if pressurized, will climb at Glen Cove to 10,000 or above, proceed via Paterson, Red 23, Red 13 and Red 21.

From Newark, via Chatham, Red 21, Red 8 west; or via Red 26 northwest.

Southwest and southbound flights will be cleared:

From LaGuardia, via Paterson, Red 23 and Red 33; or via Chatham, Red 72, Green 4 to Red 33.

From Idlewild, via Green 5 southwest and via Sully, Woolf southeastbound.

From Newark, via Chatham, Red 72 like LaGuardia and later via Willow Grove to Lancaster on a new airway.

Traffic approaching the New York area will most likely be routed as follows:

To LaGuardia, via Amber 7 and New Canaan from the northeast, and via Peekskill, Westchester LOC from north.
—via Green 3 from the west, and via Red 23, Red 26 to Green 3 from NW.
—via Philadelphia and Red 3 from the southwest, and via Amber 9 from the south when re-commissioned.

To Idlewild, via Westchester and Glen Cove from the north, and via Green 5 and Mitchel from northeast, east.
—via Red 23, Red 26 and Green 3 from the northwest, and
—via Green 3 from the west, and Green 5 from the southwest and south.

To Newark, via Blue 18 and Paterson from the north and northeast,
—via Red 26, Green 3 and New Brunswick from the northwest and west,
—via Philadelphia and Amber 7 from the southwest and south.

For Radio Facility changes see Page 60

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The Navy takes to the air...

1911

On July 26, 1911, Glenn Curtiss put pontoons on his pusher type plane and flew it at San Diego, California, demonstrating to Navy officials the practicability of the hydro-plane. Enthusiastic over the experiments, the Navy soon placed an order for its first hydro-aeroplane shown here taking off.

1952

NEW MEMBER of the U. S. Navy fighter plane family, the Grumman F9F-6 Cougar is rated in the "over 650 miles an hour" class. A swept wing successor to the Panther, which was the first jet to be used in combat by the Navy, this new streamlined jet fighter is described as a much faster plane.

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